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Public Roads

A JOURNAL OF HIGHWAY RESEARCH

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Motor-Vehicle-Use Studies in Six States

BY THE DIVISION OF RESEARCH
BUREAU OF PUBLIC ROADS

Reported by
THURLEY A. BOSTICK, Transportation Economist,
ROY T. MESSER, Highway Transport Research Engineer, and
CLARENCE A. STEELE, Chief, Taxation and Economic Studies Section

Up-to-date information about the characteristics of motor-vehicle ownership and use supplies some of the needs of highway administrators in the broad planning of highway programs. This report analyzes many of the findings that have recently become available from the first of the motor-vehicle-use studies conducted by the State highway departments since the close of World War II.

The primary purpose of the report is to indicate to those who may have use for such information the types of data that are available from the motor-vehicle-use studies and some of the principal relations that these data may best be used to demonstrate—such information as the distribution of vehicle ownership geographically and by occupational groupings, the characteristics of vehicle use, including annual travel, road systems used, places of travel, trip length, and travel purpose, the age distribution of vehicles, the transportation media used by workers traveling to work, and the age and sex of motor-vehicle operators.

A secondary purpose of the report is to provide factual information based on the findings of the studies conducted in the six States covered, but it must be remembered that these States—located in the north central and south central parts of the country—are not sufficiently well distributed to provide even an approximation of Nationwide coverage.

THIS REPORT presents the results of motor-vehicle-use studies conducted during the summer of 1951 in six States—Arkansas, Louisiana, North Dakota, Oklahoma, South Dakota, and Wisconsin. These studies, and others of a similar nature that have since been undertaken, provide information about the characteristics of motor-vehicle ownership and use that is not available from the ordinary types of traffic surveys. Similar data for a number of these characteristics were obtained in studies made by most of the State highway departments between 1930 and 1940, but it was generally believed that this information was no longer fully representative of existing conditions.

Since this report is based on data obtained during a single season in 1951 in only six States (and some of the information was not available for all six), the presentations made must be considered as being subject to modification as more information of wider coverage and more recent date is received. Furthermore, because of their location, it should not be assumed that the findings of studies made in these few States are representative of the Nationwide situation. However, it is believed that the findings reported herein, especially those presented for individual population or occupation groupings, can be considered as being generally indicative, within reasonable range, of conditions that now exist.

SUMMARY OF FINDINGS

Motor-vehicle distribution.—Among the characteristics of motor-vehicle distribution revealed by these studies were the following:

Motor vehicles were owned or operated by residents of nearly three-fourths of all occupied dwelling units; the range was from 80 percent in unincorporated areas to 57 percent in cities of over 100,000 inhabitants. Motor vehicles were owned by 84 percent of all farm families.

Two or more automobiles were owned in 1 of every 15 households. Trucks only were operated by residents of 1 of every 14 households.

The average age of all automobiles in use in 1951 was 7.1 years; in 1941 it was 5.5 years. In 1951, 4 out of 10 vehicles in use were prewar models (built in 1941 or earlier).

Motor-vehicle operators.—Analyses of information reported about motor-vehicle operators showed the following significant characteristics:

Fifty-three percent of all persons 14 years or older were licensed to drive.

Two-thirds of the licensed drivers were males.

About one-fourth of the licensed drivers of both sexes were found in the 30-39 age group, more than in any other group.

Travel to and from work.—These studies, which covered all modes of home-to-work transportation, revealed that the automobile was the principal means used by gainfully employed persons for such travel. The highlights of the findings with respect to home-to-work transportation are as follows:

Sixty-eight percent of all workers used transportation or walked between their homes and places of work; 32 percent worked at their place of residence (91 percent of the farmers and farm managers lived on the farms they operated).

Sixty-one percent of the workers who used transportation or walked to and from their jobs used automobiles for all or part of the trip.

Even in the group that lived less than 1 mile away, nearly one-half of the workers traveled to work by automobile. For those traveling greater distances, 67 to 85 percent traveled to work by car, depending on the distance traveled.

One out of six workers who used transportation or walked to work walked the entire distance; 85 percent of these lived closer than 1 mile. Beyond 1 mile from place of employment, walking ceased to have significant influence as a mode of travel to work.

Only in cities of over 100,000 inhabitants did more than one-third of all workers use public transit as a means of travel to work. Even in these large cities more workers traveled by auto than by public transportation.

Distribution of automobile travel.—These studies provided the distributions of automobile travel for residents of the State by place of travel, according to the place of residence and occupation of the principal operator.

Approximately one-half of the travel by both rural residents and residents of incorporated places was on the rural primary roads.

Travel on the local rural roads was mostly by the rural residents.

The percentage of travel on city streets by urban residents varied in direct relation to the size of the city of residence.

Trips confined entirely within one city or contiguous cities comprised one-half of the automobile travel within incorporated places by all residents of the State. In the large cities this proportion reached 75 percent.

Only 8 percent of all travel occurred outside the State of residence. The range by occupation was from under 3 percent for farmers to about 11 percent for professionals, proprietors, and clerks.

Farmers and farm managers used the local rural roads more and city streets less than any other occupational group.

There was relatively little difference in the total use of primary State highways by occupational groups. The range was from 50 percent for farmers to 61 percent for the professional group.

Automobile trip lengths.—The pattern of highway use by passenger cars was found to be composed predominantly of short-length trips.

Six of every ten one-way trips were under 5 miles in length. Four-fifths of the trips were less than 10 miles in length. The average one-way length of trip was 8.3 miles.

One-half of the total travel resulted from trips of under 30 miles one-way length.

Trip-length frequency distributions were similar for residents of each population group and for the several occupational groups. Trip-length frequency distributions were also generally similar for all purposes of travel except vacations and, to a lesser extent, medical and dental.

Shopping trips were the shortest and vacation trips the longest, averaging 3.7 and 250 miles, respectively.

Purpose of travel.—Automobile travel was analyzed according to purpose for which the trips were made. Some of the significant relations which were found in these analyses are outlined below.

Sixty percent of the travel and 73 percent of the trips by passenger cars were for the purpose of "necessity" travel (earning a living or family business). About three-fourths of this travel and two-thirds of the trips were made in connection with earning a living. One-half of the travel and two-thirds of the trips made in connection with earning a living resulted from travel to and from work.

Both rural and urban residents performed about 45 percent of their total automobile travel in connection with earning a living.

Family business and educational and related travel accounted for a greater proportion of the total travel by residents of unincorporated areas (25 percent) than it did for residents of incorporated places (14 percent). On the other hand, a higher proportion of travel for social and recreational purposes was found for the residents of incorporated places (43 percent) than of unincorporated areas (29 percent).

"Necessity" travel—for earning a living or family business—averaged between 55 and 65 percent for gainfully employed workers in most occupational groups.

Comparison with earlier studies.—It was possible to make certain comparisons of automobile travel between the motor-vehicle-use studies and the earlier road-use studies in four of the States. In spite of a major shift in the classification of rural mileage in Louisiana, the findings of the studies were remarkably consistent:

Although the total travel on each class of roads and streets was considerably greater in 1951 than in 1936, the proportion of travel on city streets to total travel decreased from 35 to 27 percent.

For residents of incorporated places, the travel distribution showed a decline in travel on city streets from 43 percent in 1936 to 36 percent in 1951. For residents of unincorporated areas, the travel distribution by place of travel in 1951 was almost identical to that of the earlier studies.

DESCRIPTION AND STATUS OF STUDIES

Statistical studies of motor vehicle use are not new. The present projects are but the latest in a series of similar investigations that have taken place over a period of more than 20 years. The studies have all had a common basic set of purposes: to learn more about the characteristics of motor-vehicle ownership and use than can be learned from the ordinary types of traffic surveys. These purposes may be stated in more detail as follows:

1. To learn how the ownership of automobiles and trucks is distributed geographically among rural residents and city dwellers, and among various occupational groupings.
2. To determine the characteristics of the use made of private and commercial motor vehicles by the various ownership groups mentioned above. These include estimates of annual travel of automobiles and trucks, road systems used and places of travel, and trip length and purpose of travel.
3. To determine the age distribution of the automobiles owned by various segments of the population, and the age and weight distribution of the commercial vehicles owned by the major groups, such as farmers and retail establishments.
4. To learn something about the rates of fuel consumption of motor vehicles, classified according to residence of owner, vehicle type, and age groups.
5. To obtain information about the transportation media used by gainfully-employed workers in getting to and from work.

Such information has many uses both to government agencies and to business and industry. Perhaps its most important uses are in connection with the development of long-range plans for the construction and reconstruction of the several systems of roads in a given State, especially the financial and economic aspects of such programs. Data of these types are especially valuable in determining equitable bases for the apportionment to highway purposes of motor-vehicle-user tax receipts. They have also been helpful in other State and Federal legislative programs.

In times of national emergency such data are essential in the determination of the allocations of critical materials and equipment for the construction and maintenance of highways and the allocation of critical materials, such as steel and rubber, to industry for the manufacture of parts, tires, and accessories to keep vitally needed vehicles in service. During World War II such information was also used in determining the bases upon which motor fuel and tires were rationed to the public.

Industry, especially in the automotive field, finds information obtained from such studies useful in planning and developing production and markets. From time to time various industry groups have made studies of the motor vehicle and its usage to meet particular needs. Since such studies have been limited in their coverage, these groups have been especially anxious to have the benefit of the more inclusive data developed from the motor-vehicle-use studies.

Description of Present Studies

The present motor-vehicle-use studies combine features from several types of earlie studies, notably the road-use and motor vehicle-allocation studies made during th period from 1935 to 1940; the war-industry transportation studies made during Worl War II; and the metropolitan area origin and-destination studies that have been i progress since the end of the war. They ar sampling studies in which the sample base the number of dwelling-units, which is b lieved to be the best available base for such study. It has the advantage of being universal base for which reasonably curre statistics are available for the Nation, t individual States, and various populati groupings or individual places within t States. It also has the advantages of bei more stable, less inflated, and more readi measurable than are motor-vehicle registr tions, which were used as the sampling ba for the road-use and motor-vehicle-allocati studies. (Motor-vehicle registrations cov the total registered in a whole year, rath than the number of vehicles in use at particular time.)

The samples, which are scientifically draw are relatively small—often as small as one-h of 1 percent in some population groups—b large enough to provide reasonable stabili in the values sought on a Statewide popu tion-group basis. In some States, wh supplementary data on trucks are need separate truck samples are drawn. Int viewers are sent to call upon the residents each dwelling unit chosen in the samp The respondents are asked to provide t following information:

1. Listing of residents of the dwelling u indicating sex, approximate age, and whet or not those of legal driving age poss vehicle operators' permits;
2. Occupational information about th residents who are gainfully employed, tance to place of work, and means of gett to work;
3. Inventory of automobiles and tru regularly driven by residents of that dwell unit;

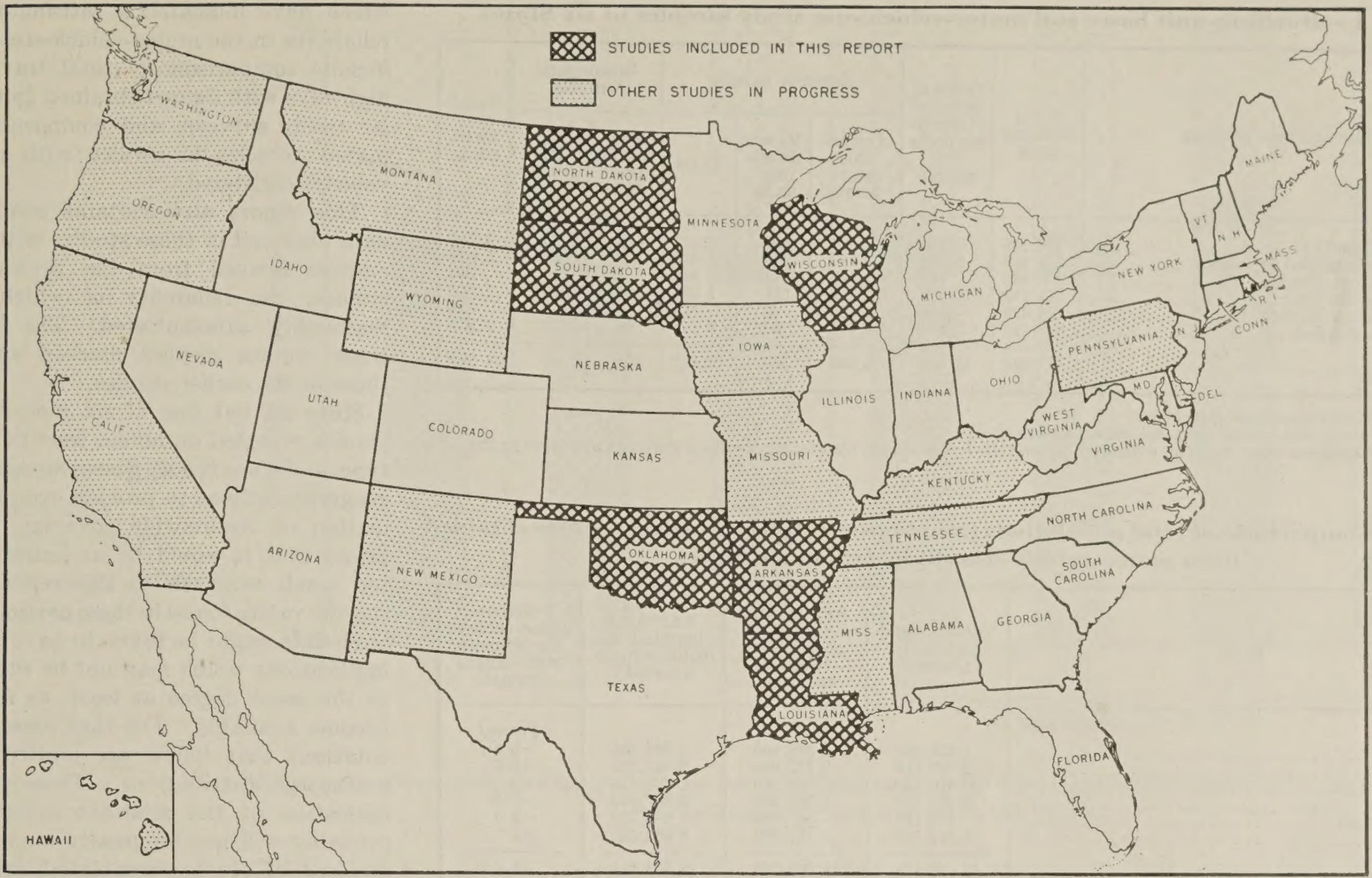

Figure 1.—States participating in the motor-vehicle-use studies; August 1954.

4. Estimated total annual travel of vehicles reported upon, and the fuel consumed by them;

5. Description of motor-vehicle trips made by residents of the dwelling unit, ending on certain days, on which a resident was the driver of the vehicle. Information sought includes the origins and destinations of such trips, purposes, routes used, trip length, and number of persons carried in the vehicle. In the case of truck trips, the general description and weight of commodities hauled is also sought.

The procedure recommended for the motor-vehicle-use studies provides for full-year coverage of ownership and travel data by dividing the sample to be obtained in each population group into four equal segments, one to be taken each season. By this means the effects of the seasons upon characteristics of travel will be properly reflected for each population group. A further indication of the annual character of long-distance travel is obtained by asking the respondents to provide information about all trips of more than 7 days duration made during the last 12 months prior to the time of interview.

However, the complete 1-year study described above has not been made in all States where the motor-vehicle-use study has been undertaken. Where the sampling covered only one or two seasons, special analysis procedures had to be designed to expand the data obtained to an annual basis. Where all four seasons were covered, the analysis of the travel and related data obtained involved a straightforward expansion by which the level of each seasonal segment of the sample was raised to the level of the universe for that season by the application of expansion factors reflecting the relation of the sample to the universe. The combination of the seasonal data to obtain figures for a year is a relatively simple process.

Unlike the ordinary traffic survey, the motor-vehicle-use study is not intended to obtain any information about the use of the highways of the State being studied by vehicles not registered or kept there. It does, however, provide information about total vehicle use—in and outside of State of residence—of private and commercial vehicles that is not obtained in the ordinary traffic survey. Also, the motor-vehicle-use study provides information about the rural-urban breakdown of trips that is not obtained in the traffic survey.

The studies were conducted by the State highway departments as highway planning projects, with the technical cooperation of the Bureau of Public Roads. The highway departments have used great care in selecting the enumerators who contacted the respondents, and public reaction to the study has been very good. In two instances, the highway departments have enlisted the services of the United States Bureau of the Census in organizing and conducting the field work; in all other instances the enumerators have been employees of the highway departments.

Status of Motor-Vehicle-Use Studies

In August 1954, motor-vehicle-use studies had been completed or were then in progress in 20 States and in the Territory of Hawaii. Their location and status are shown graphically in figure 1. Thirteen of these studies were of the full, extended type; i. e., they cover the four seasons of an entire year. Three were of the modified-extended type where the size of the sample taken was somewhat less than would be taken in a complete full-year study, and the sampling was confined to one or two seasons. The remaining five studies were of the limited type in which the size of the sample taken was approximately equal to that which would normally be taken in a single season, and the interviewing was completed within one season. The limited study is intended only to be used in connection with data obtained in other States in determining regional characteristics of vehicle ownership and travel; the samples taken are usually not large enough to provide stable statistics for the one State only.

In one State, South Dakota, the officials were so well pleased with the results of a limited study that they have since made a complete extended study.

Coverage of This Report

Although interviewing is complete and analysis complete or far along in a number of States, data for only a few have so far been furnished to the Bureau of Public Roads, and some of those reports are incomplete. Accordingly, it has been necessary to base this report upon the results obtained in only a few States, and the presentations made must be considered as being only preliminary and subject to modification as more information from other States is received. The data shown

Table 1.—Dwelling-unit bases and motor-vehicle-use study samples in six States

State and type of study	Total dwelling units	Original estimate of dwelling units in sample	Effective sample			Incomplete contacts		Total contacts made
			Acceptable interviews	Vacant dwelling units	Total	Nonusable interviews	Refusals	
Arkansas (limited)	576,054	3,468	3,327	290	3,617	31	10	3,658
Louisiana (modified extended)	731,816	5,063	4,783	295	5,078	560	(1)	5,638
North Dakota (limited) [2]	177,980	441	326	19	345	1	----	346
Oklahoma (limited)	724,790	1,502	1,363	115	1,478	208	20	1,706
South Dakota (limited) [3]	195,079	523	504	9	513	9	1	523
Wisconsin (limited)	1,082,216	2,599	2,091	60	2,151	58	12	2,221
Total	3,487,935	13,596	12,394	788	13,182	867	43	14,092

[1] Included with nonusable interviews.
[2] North Dakota also conducted a full-scale road-use study.
[3] South Dakota has since made an extended motor-vehicle-use study, the results of which were not available at the time of this report.

Table 2.—Comparisons of total populations from Census estimates with estimates obtained from motor-vehicle-use study data in six States

State	Total population, 1950 Census	July 1, 1951, total population (Census estimate)	Estimated population, motor-vehicle-use study	Difference, motor-vehicle-use estimate from Census estimate
				Percent
Arkansas [1]	1,335,053	1,325,000	1,234,895	−6.8
Louisiana	2,683,516	2,747,000	2,641,265	−3.8
North Dakota	619,636	602,000	625,724	+3.9
Oklahoma	2,233,351	2,262,000	2,087,942	−7.7
South Dakota	652,740	647,000	633,759	−2.0
Wisconsin	3,434,575	3,481,000	3,680,043	+5.7
Total	10,958,871	11,064,000	10,903,628	−1.4

[1] Persons under 14 years of age excluded.

herein include the modes of travel used in going to and from work, the distribution of licensed motor-vehicle operators, the characteristics of motor-vehicle distribution, and the characteristics of travel, such as distribution and purposes of travel by systems and classes of places and length of trips. The data were developed from reports received from six States: Arkansas, Louisiana, North Dakota, Oklahoma, South Dakota, and Wisconsin. As will be indicated in the text, some types of information were available for all six States; some for only four or five of the six.

Information relating to total annual travel and average annual mileage per vehicle is omitted from this report since the studies made by the six States were conducted in the summer season only.

Table 1 indicates the coverage of these studies on a Statewide basis, and shows the dwelling-unit universe, the original estimates of the samples to be obtained, the effective samples obtained, and the incomplete interviews reported. Because of the differing sample rates employed in the various population groups, it is not possible to calculate the effective Statewide sampling rate from these data.

The procedures recommended for the extended studies are designed to provide general coverage of the "universe" of private and commercial automobiles, trucks, and tractor-trucks domiciled in any State studied. The hypothesis upon which the sampling methods is based considers that through the dwelling-unit contacts a representative cross-section of operators of all classes of these vehicles, including drivers of fleet-operated vehicles, such as company-owned automobiles assigned to salesmen, and of over-the-road transport trucks, would be obtained. However, the total number of some of these classes of vehicles in operation in most States is relatively small, and the sampling rates ordinarily employed even in the extended studies are so low that it is not to be expected that the samples obtained will be large and stable enough to permit separate analyses to be made for such groups. It is for that reason that the supplementary truck studies previously mentioned are made.

In the case of limited studies, such as those reported upon here, the total truck samples obtained in some population groups were extremely small and their stability is open to question. Consequently, presentations of travel and trip-length information for trucks have been omitted from this report.

Reliability of Data

Although certain tests of the reliability of the information obtained in the motor-vehicle-use studies can be made by statistical estimates, perhaps the most reliable indications are found when values computed from the samples are compared with totals for those items that are known or can be readily approximated from other sources. For example, table 2 shows comparisons of known and estimated population totals for the six States for which data are presented in this report. It can be seen that the population estimates obtained by expanding the samples very closely approximated the estimates made by the Bureau of the Census for 1951. Other comparisons which have indicated a satisfactory level of reliability in the motor-vehicle-use study data include comparisons of total travel on rural highways with figures obtained from the regular traffic surveys, and comparisons of estimated vehicles in service with numbers of vehicles registered.

This report also contains comparisons of data obtained in these studies with like information derived from the prewar road-use studies, the reliability of which has been reasonably substantiated. The findings of these studies display marked similarity to those of the earlier studies.

Since all but one of six motor-vehicle-use studies reported on herein were of the limited type, and since the six States are not so located geographically as to provide even an approximation of Nationwide coverage, it was believed that it would be undesirable to place too much emphasis in this report upon the specific values found in these particular studies. Such data might be taken to have Nationwide implications which may not be substantiated, to the same degree at least, as further data become available. For that reason the presentations that follow are limited largely to percentage distributions. These yield a clear indication of the relations involved, which probably will not be greatly modified by the findings of studies completed subsequently, although even this is conjectural.

MOTOR-VEHICLE OWNERSHIP

One of the major purposes in making the motor-vehicle-use studies is to learn how the ownership or situs of automobiles and trucks is distributed geographically and among various economic groupings within the population. This report presents preliminary information on these subjects that have been obtained in the studies made in the six States previously mentioned.

In these studies, the place of ownership is considered to be the place of residence of the regular driver of the vehicle. By far the greater number of vehicles reported upon were owned and operated by the respondents from their places of residence.

Distribution of Motor Vehicles

Figure 2 and table 3 indicate for the six States combined the percentage classification of occupied dwelling units, in total and by population groups, according to nature of motor-vehicle distribution. This same information for individual States with population groups combined is shown in figure 3.

It will be noted, in figure 2 and in many of the following figures, that data are represented for all places combined, then separately for unincorporated and incorporated places, and finally for each population group of the incorporated places.

From table 3, it may be observed that 27 percent of all dwelling units (households) for all population groups combined reported that neither cars nor trucks were owned. In the unincorporated areas only 20 percent of the dwelling units were without either automobiles

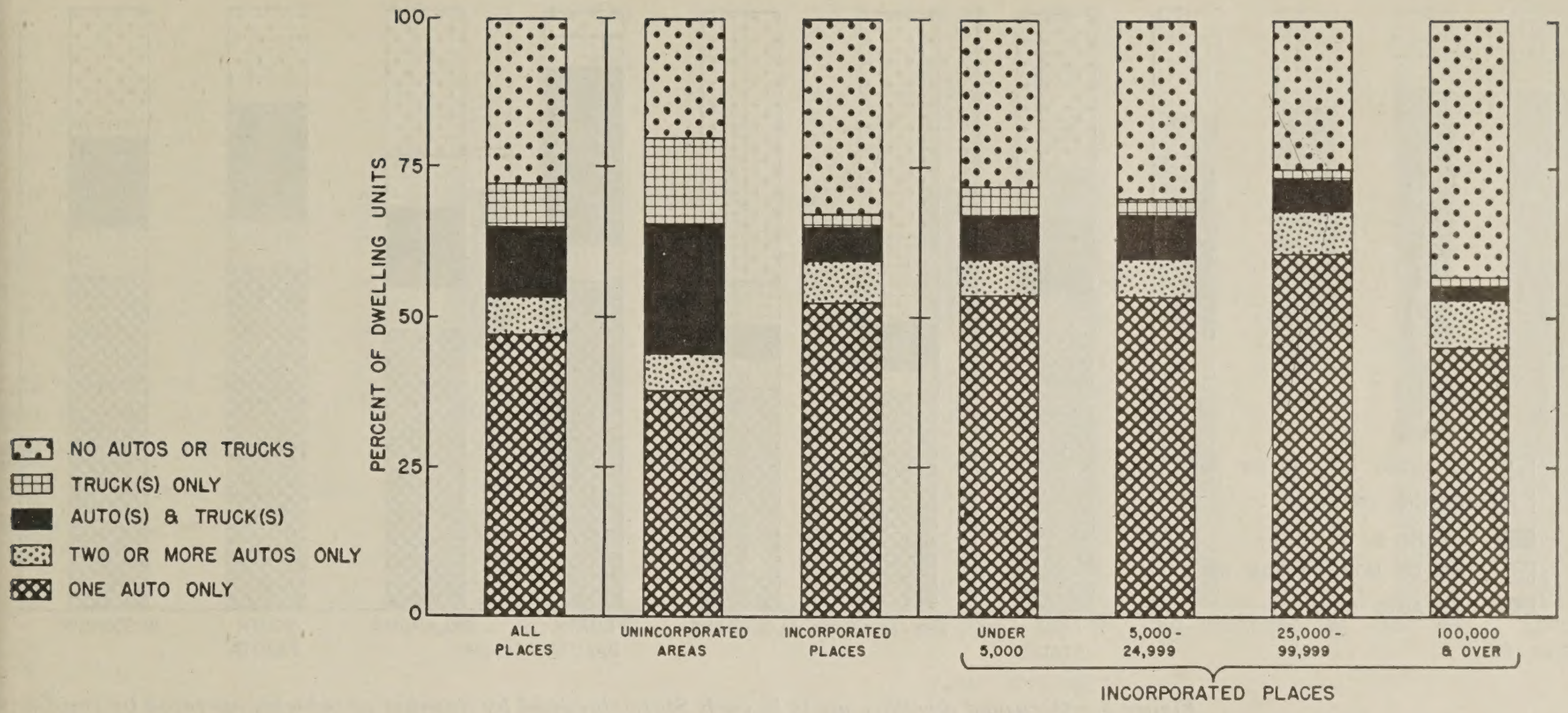

Figure 2.—Occupied dwelling units in each population group classified by number of vehicles operated by residents; summer of 1951, six States.

or trucks, while the cities of 100,000 inhabitants or more reported 43 percent. This points out the obvious—the essentiality of motor vehicles to those living in rural areas and the effects of adequacy of public transportation and the expense of motor-vehicle ownership upon residents of the largest cities.

Among the individual States, the range in dwelling units with no motor vehicles, as shown in figure 3, was from 4 percent in North Dakota to 45 percent in Louisiana.

Households reporting one automobile only and no other vehicles comprised 47 percent of the total for the six States, with a range of from 36 percent in Arkansas to 57 percent in South Dakota. The ownership of one automobile, and no other type of motor vehicle, was lowest in the unincorporated areas and highest in the medium-sized cities of 25,000–99,999 population.

Multiple-car ownership (without the accompanying ownership of trucks) did not bulk large in any population group, all appearing to cluster rather closely around the average for all groups of 7 percent of the total of all dwelling units. Here the range was from 4 percent in Arkansas to 8 percent in Wisconsin.

Table 3.—Classification of occupied dwelling units by population groups, according to nature of motor-vehicle distribution; [1] summer of 1951, six States [2]

Classification	All population groups	Population group					
		Unincorporated areas	Incorporated places with population of—				
			All places	Less than 5,000	5,000–24,999	25,000–99,999	100,000 and over
DISTRIBUTION BY POPULATION GROUPING							
Dwelling units having:	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
One auto only	46.9	37.9	52.7	53.8	53.7	60.9	45.5
Two or more autos only	6.6	6.2	6.8	5.9	6.3	7.0	7.9
Auto(s) and truck(s)[3]	11.9	21.8	5.6	7.6	7.5	5.7	2.2
Truck(s) only [3]	7.1	14.1	2.6	4.9	2.6	1.6	1.3
All dwelling units having vehicles	72.5	80.0	67.7	72.2	70.1	75.2	56.9
Dwelling units having no autos or trucks	27.5	20.0	32.3	27.8	29.9	24.8	43.1
All occupied dwelling units	100.0	100.0	100.0	100.0	100.0	100.0	100.0
DISTRIBUTION BY DWELLING-UNIT CLASSIFICATION							
Dwelling units having:							
One auto only	100.0	31.6	68.4	19.4	16.2	15.2	17.6
Two or more autos only	100.0	37.0	63.0	15.1	13.6	12.6	21.7
Auto(s) and truck(s)[3]	100.0	71.5	28.5	10.6	8.9	5.6	3.4
Truck(s) only [3]	100.0	77.4	22.6	11.7	5.1	2.6	3.2
All dwelling units having vehicles	100.0	43.2	56.8	16.8	13.6	12.2	14.2
Dwelling units having no autos or trucks	100.0	28.5	71.5	17.1	15.3	10.6	28.5
All occupied dwelling units	100.0	39.2	60.8	16.9	14.1	11.7	18.1
Number of occupied dwelling units	*3,355,023*	*1,313,582*	*2,041,441*	*565,820*	*473,281*	*393,294*	*609,046*

Cases in which one or more automobiles and one or more trucks were owned or kept at the same dwelling unit were reported for 12 percent of all dwelling units, and ranged from 5 percent in Louisiana to 30 percent in North Dakota, a situation which may be traceable to the difference in the types of agriculture practiced in the two States. As might be expected, the ownership of both automobiles and trucks in a household was concentrated in the unincorporated areas, where such ownership was reported for 22 percent of all households. In contrast, ownership of combinations of vehicles was reported for only 2 percent of the dwelling units in cities of 100,000 inhabitants or more.

Dwelling units for which the ownership of trucks only was reported included 7 percent of the six-State total, and ranged from 2 percent in Wisconsin to 16 percent in Arkansas. Among the various population groups the range was from 14 percent in the unincorporated areas to 1 percent in the incorporated places of 100,000 inhabitants and more.

Some of the differences in the chacteristics of motor-vehicle ownership among the six States may be observed more readily in figure 3. By far the largest percentage of families owning no vehicles were found in the two Southern States of Arkansas and Louisiana, 37 and 45 percent, respectively. On the other hand, the lowest percentage of families without motor vehicles was found in North Dakota where only 4 percent were reported. Ownership of one or more passenger cars and no trucks ranged from about 41 percent each in Arkansas and Louisiana to 65 percent each

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[1] For the most part, the vehicles are owned in the places where the respondents reside. In some instances, however, they are garaged and/or owned elsewhere and operated regularly by a person or persons living at the dwelling unit.

[2] Arkansas, Louisiana, North Dakota, Oklahoma, South Dakota, and Wisconsin.

[3] Including tractor-trucks but not semitrailers or trailers.

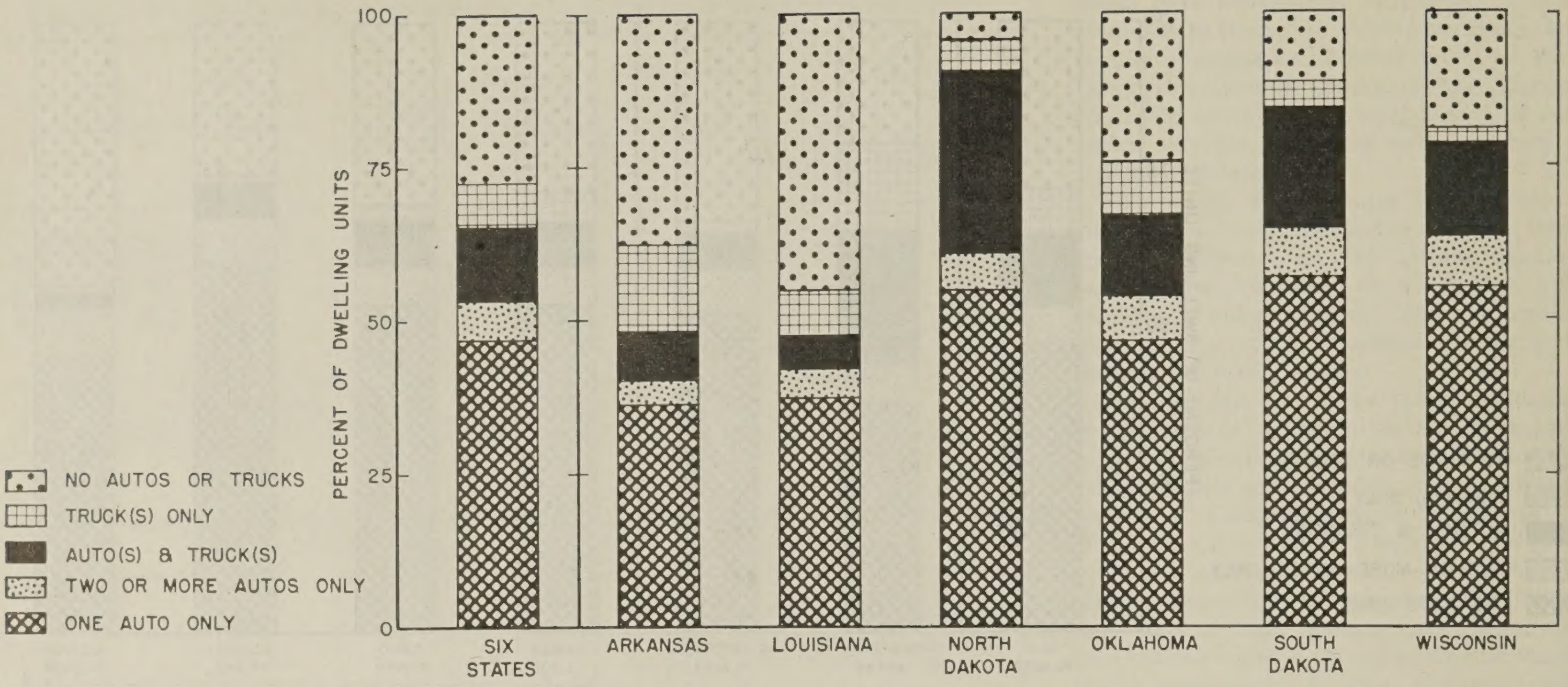

Figure 3.—Occupied dwelling units in each State classified by number of vehicles operated by residents; summer of 1951, six States.

in South Dakota and Wisconsin. The incidence of truck ownership either with or without automobiles was by far the greatest in North Dakota, where 35 percent of the dwelling units fell into this class.

Motor Vehicles on Farms

It is a common assumption that the average American farmer today is almost completely dependent upon motor vehicles to provide transportation for himself and his family, and to carry his products to market and his supplies to the farm. It has been generally assumed that in farming areas there is usually at least one motor vehicle owned at each operating farm unit, and that both automobiles and trucks will be found at many. The preliminary findings of the motor-vehicle-use studies not only substantiate this assumption, but also provide some very enlightening supplemental information.

Incidentally, if it appears that this report devotes considerable attention to the farmer and his use of motor vehicles, it should be remembered that the six States reported on are predominantly agricultural.

An indication of the reliability and stability of the motor-vehicle-use study samples is shown in table 4. This table indicates reasonable similarity in the distribution of farms according to acreage between the information obtained in the 1950 Census of Agriculture and that obtained in the motor-vehicle-use studies. As might be expected, the best comparison was found in Louisiana where the largest sample was taken. It will be noted that in four of the six States the percentage of farms containing less than 10 acres is greater in the motor-vehicle-use study totals than in the Census totals. This undoubtedly arises from differences in the definitions of farms used in the two investigations. In some States the motor-vehicle-use study interviewers classified as farms many small homesteads which were not so classified by the census enumerators. Other minor differences in definition are known to exist which would particularly affect the distribution of farms of less than 10 acres as compared with the other groups. One of these differences, resulting in a high percentage of farms of less than 10 acres, was the classification in the Wisconsin study of all dwelling units in the unincorporated areas as farms.

Figure 4 indicates, for the six States combined, the percentage distribution of motor-vehicle ownership by farm-acreage groupings. Over 84 percent of all families living on farms owned automobiles or trucks or both. Among the various acreage groups the range was from 52 percent on the farms of 10–29 acres to over 95 percent on the four farm-acreage groups of 180 acres or more. For farms of all sizes combined, the range among the samples obtained in the six States was from about 65 percent in Arkansas and Louisiana to 100 percent in North Dakota.

For all farms it may be noted that ownership of automobiles only was reported for 43 percent, with ownership of one or more automobiles together with one or more trucks accounting for an additional 26 percent. Ownership of trucks only was reported for 15 percent.

Table 4.—Comparisons of distributions of farms according to acreage as determined from 1950 Census of Agriculture and as reported in motor-vehicle-use studies; [1] summer of 1951, six States

Size group	Percentage distribution of farms according to acreage													
	Six States		Arkansas		Louisiana		North Dakota		Oklahoma		South Dakota		Wisconsin	
	Census	Study	Census	Study	Census	Study	Census	Study	Census	Study	Census	Study	Census	Study
Acres	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Less than 10	6.3	11.4	9.0	13.4	12.2	15.4	0.9	(2)	5.5	8.8	2.1	1.8	3.5	14.8
10–29	13.4	10.3	21.7	24.1	33.7	28.0	.9	(2)	7.3	4.9	1.8	(2)	4.1	4.1
30–49	10.9	8.8	17.5	15.8	21.0	21.2	.7	(2)	8.1	6.7	1.4	.5	6.6	5.4
50–99	17.1	19.3	22.0	21.9	16.3	19.0	1.4	(2)	15.8	18.2	3.3	2.7	25.0	26.8
100–179	20.9	23.3	16.7	14.1	8.4	8.6	8.2	4.7	25.6	34.7	15.7	29.9	37.5	30.5
180–259	8.8	8.3	5.9	5.5	2.9	3.2	5.0	2.7	11.0	7.3	12.0	9.5	14.5	12.9
260–499	12.7	9.8	4.8	2.8	2.9	3.2	35.7	41.6	17.3	14.3	32.9	22.2	7.8	3.9
500–999	6.6	5.8	1.7	1.7	1.5	1.2	33.8	36.9	6.5	3.6	17.6	17.6	.9	1.1
1,000 and over	3.3	3.0	.7	.7	1.1	.2	13.4	14.1	2.9	1.5	13.2	15.8	.1	.5
All farms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Motor-vehicle-use studies exclude those few farms where acreage was not reported. [2] None reported.

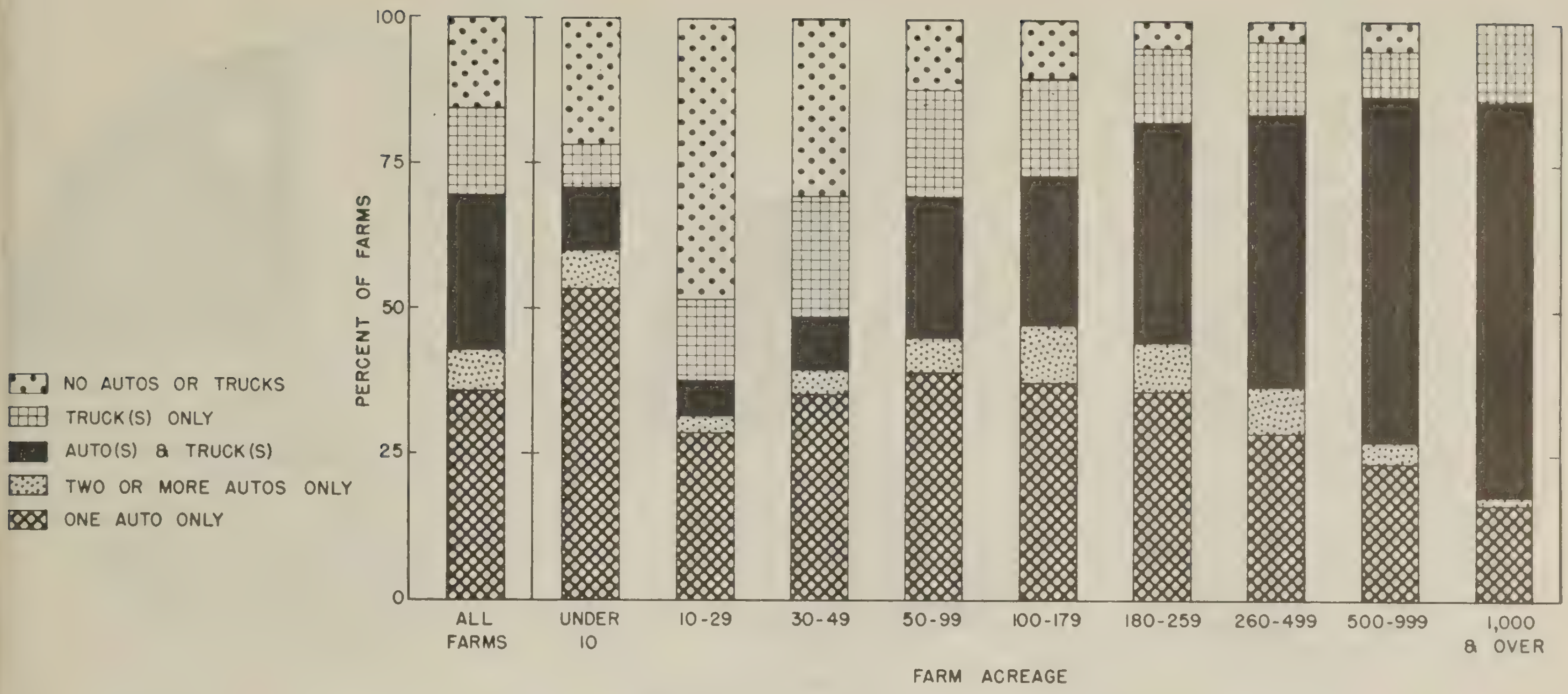

Figure 4.—Occupied farm dwelling units in each farm-acreage group classified by number of vehicles operated by residents; summer of 1951, six States.

Families living on farms of less than 10 acres had the highest percentage of one-automobile ownership, 53 percent. Perhaps one reason for the large number of one-automobile owners in this acreage group is that many of the people living on these small homesteads have other employment by which they obtain or supplement their income. Most of these "farms" probably do not produce sufficiently to warrant ownership of trucks.

Families living on farms of 10–29 acres had the highest percentage of non-ownership of vehicles, 48 percent, while those living on farms in the 30–49 acre group reported the next highest incidence of non-ownership with 30 percent. These figures are both much higher than the comparable 16 percent for all farm families. The farms of 10–29 acres and 30–49 acres probably include many subsistence-farming operations which produce only small quantities of products for sale. The Census data shown in table 4 clearly indicate the concentration of these smaller farms in Arkansas and Louisiana.

Less than 7 percent of farms in all acreage groups reported two or more automobiles only, with a range from 2 and 3 percent in Louisiana and Arkansas, respectively, to 11 percent in Wisconsin. Among the individual acreage groups, the range was from 2 percent in the case of the farms of 1,000 or more acres to 10 percent in the case of farms containing 100–179 acres.

Of all families living on farms of all sizes, 27 percent owned one or more automobiles and one or more trucks. Among individual acreage groups the range was from 6 percent in the 10–29 acreage group to 68 percent in the 1,000 or more acreage group. The percentage of farms having both automobiles and trucks rises rapidly as the acreage becomes larger. Arkansas and Louisiana reported the lowest percentage of families owning both cars and trucks, 8 and 9 percent, respectively, while the range in the other States was from 23 percent in Oklahoma to 58 percent in North Dakota.

In the six States, 15 percent of farm families owned trucks only, with a range from 7 percent on the farms of less than 10 acres to 21 percent on the farms of 30–49 acres. Many families residing on farms use a truck for all their travel needs. In three States, over 20 percent of all farms of all sizes had trucks only; the other three States reported less than 10 percent in this category.

Age of Automobiles in Use

In 1941, according to the Automobile Manufacturers Association, the average automobile in use in the United States was only 5.5 years old.[1] In 1951, according to this source, the average passenger car in use was 7.1 years old. The same source also indicates that the average age of motor vehicles at time of scrappage has increased fairly steadily from 6.5 years in 1925 to 13.5 years in 1950.[1] Since 1936 the average age at scrappage has increased at an annual rate of about one-third year. In 1941, for example, it was 10.2 years, and was probably about 13.8 years in 1951.

Better-built vehicles, better roads, wartime cessation of civilian motor-vehicle production, and improved economic conditions that have enabled more relatively low-income families to own automobiles are undoubtedly among the factors that have contributed to the increase in the average ages of vehicles now in service.

Table 5 indicates the distribution of automobiles in use classified by year models as reported by the motor-vehicle-use studies conducted in Arkansas, Louisiana, Oklahoma, and Wisconsin. Table 5 also compares the results of the motor-vehicle-use studies with the vehicle registrations for the same four States,[2] and the vehicle registrations for the United States.[1] The three distributions are closely parallel.

Table 5.—Passenger cars in use, classified by year model: motor-vehicle-use studies compared with vehicle registrations; summer of 1951, four States [1]

Year model	Motor-vehicle-use studies, summer of 1951, four States [1]	Vehicle registrations, July 1, 1951 [2]	
		Four States	United States
	Pct.	*Pct.*	*Pct.*
Postwar:			
1951	8.4	6.7	7.4
1950	15.8	15.2	15.9
1949	12.1	12.7	12.9
1948	7.2	7.7	7.7
1947	7.0	7.4	7.8
1946	4.6	5.1	5.1
Subtotal	55.1	54.8	56.8
War period, 1942–45	2.7	2.6	2.5
Prewar:			
1941	10.2	9.9	9.8
1940	7.8	7.3	7.3
1939	4.9	5.4	5.2
1938	2.9	3.6	3.2
1937	5.7	5.7	5.5
1936	4.2	10.5	3.9
1935 or older	5.7		5.6
Subtotal	41.4	42.4	40.4
Not reported [3]	.8	.2	.3
All year models	100.0	100.0	100.0
Number of vehicles, all year models	*2,172,461*	*2,334,755*	*38,516,000*

[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.
[2] For sources, see text footnotes 1 and 2, this page.
[3] This table differs slightly from figure 5 in that it includes those vehicles for which the year model was not reported.

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[1] *Automobile Facts and Figures*, 32nd ed., 1952, pp. 17, 19. Automobile Manufacturers Association, Detroit, Mich.

[2] *Automotive Industries*, 34th annual statistical issue, vol. 106, No. 6, March 15, 1952, pp. 108–115.

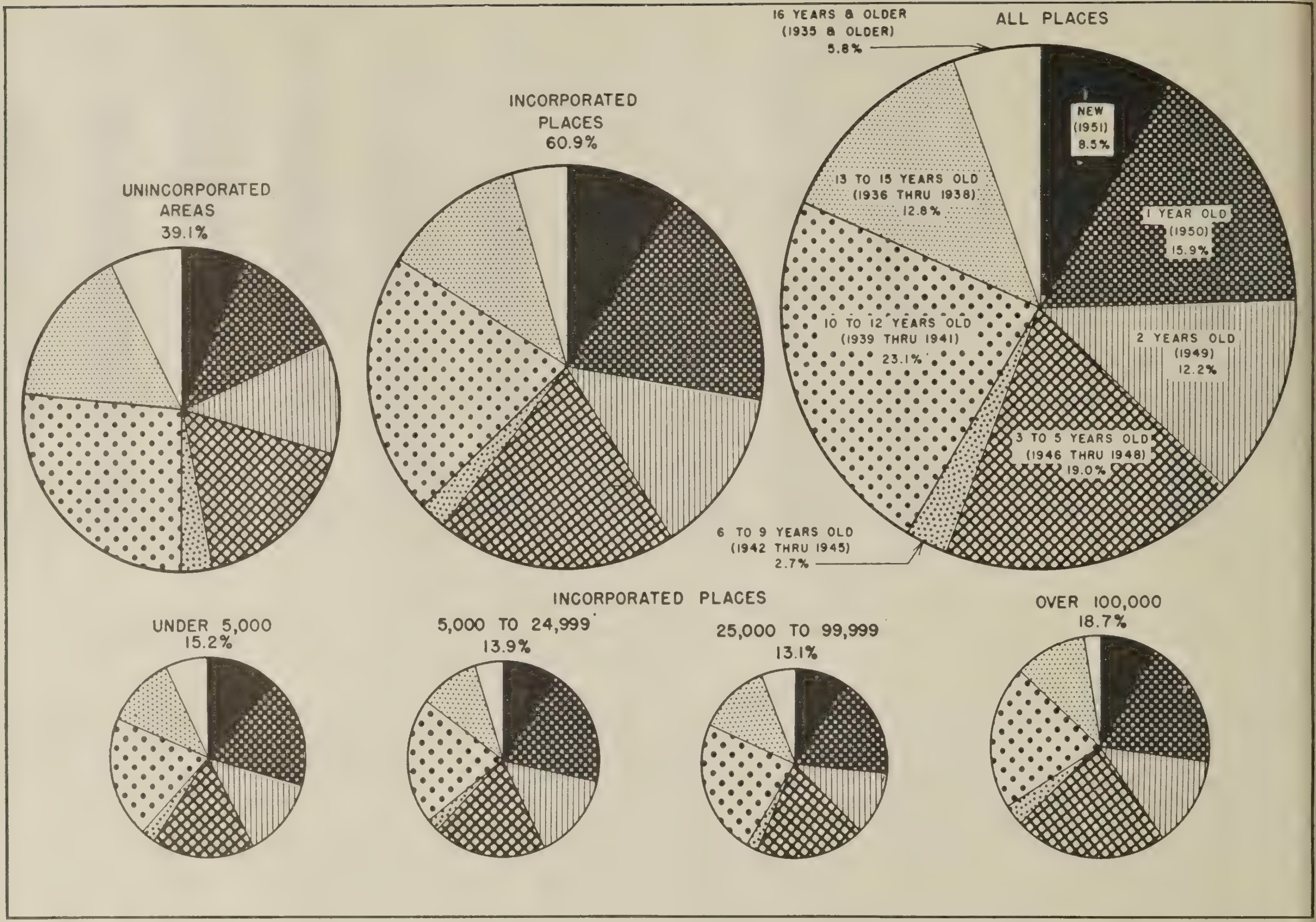

Figure 5.—Passenger cars in use, classified by year model and by residence of principal operator; summer of 1951, four States.

Population-group characteristics

Figure 5 indicates the distribution of passenger cars in use by age and by population group of residence of the operators. The information shown is for the four States for which data are presented in table 5.

Slightly less than 61 percent of the automobiles reported upon were owned in incorporated places; the remaining 39 percent were owned in unincorporated areas. About 55 percent of all vehicles were postwar models, less than 3 percent were manufactured during World War II, and nearly 42 percent were manufactured before 1942.

The ownership of the newer vehicles—those produced since 1945—appeared to be more heavily concentrated in the incorporated places, especially in the cities having populations of 100,000 or more, where 64 percent of all vehicles were postwar models. Among the four States, the postwar-model automobiles found in all population groups ranged from 49 percent in Oklahoma to 60 in Arkansas.

For all population groups combined in all four States, 8 percent of the passenger cars reported were 1951 models. Among the individual States, the range was narrow, from 7 percent in Oklahoma to 10 percent in Arkansas. In considering the 1951 cars—the new cars at the time of the studies—it should be borne in mind that they had only been in production for a half-year, since the studies were conducted in the summer of 1951.

Almost 16 percent of all automobiles owned in all population groups combined were 1950 models, which were 1 year old at the time of this study; there were more of these than any other year model covered by this report. In Louisiana 19 percent of all automobiles reported were 1950 models, the highest percentage reported by any one of the four States.

Automobiles that were 2 years old—1949 models—accounted for 12 percent of all cars of all ages reported. There was relatively little variation in the ownership of these automobiles between the unincorporated areas and the incorporated places.

Passenger cars 3 to 5 years old—1946–48 models—accounted for only 19 percent of all vehicles reported. Although 1947 and 1948 models were found to represent a greater proportion of all vehicles owned in incorporated places than in unincorporated areas, the opposite was true for the 1946 models.

The ownership of vehicles produced during the war period, 1942–45, and before the war (prior to 1942) was found to be greater in the unincorporated areas. Fifty percent of all vehicles owned in unincorporated areas in the four States combined were prewar models, while an additional 3 percent were manufactured during the war. The corresponding percentages for incorporated places were 36 and 2, respectively. Among the individual States, Wisconsin reported the lowest percentage of war and prewar automobiles in the unincorporated areas, with 48 percent so shown. The highest percentage was 62 reported for Oklahoma.

The finding that older automobiles predominate among passenger cars owned in unincorporated areas is in line with the findings of earlier studies, such as the motor-vehicle-allocation and road-use studies. When these surveys were made in the middle and late 1930's it was believed that this finding was largely the result of the combined effects of the depression and drought that had been plaguing widespread portions of the rura areas of the nation. Now, however, it appears that the phenomenon is a continuing one, persisting in good times as well as bad.

Occupational-group characteristics

The occupational classification adopted for the presentation of motor-vehicle-use-study data is essentially that adopted for the urban-area origin and destination studies made by the State highway departments with the cooperation of the Bureau of Public Roads. It is based upon a classification originally developed by the Bureau of the Census.

Although most of the classifications used are self-explanatory, some require clarification. For example, "craftsmen, foremen, and skilled laborers" include such occupations as boilermakers, carpenters, cement finishers, electricians, inspectors, locomotive engineers and firemen, mechanics, structural steel workers, and tailors. The terms "operatives" and "semiskilled workers" include apprentices, vehicle operators (such as bus and truck drivers), operators of stationary machines, miners, railroad brakemen, dockhands, seamstresses, and other workers from whom similar levels of training or skill are required. "Protective-service workers" include personnel in the armed forces, police, fire fighters, watchmen, and the like.

Although not an occupational group in the usual sense, the "housewife" category was set up separately because of the large number of instances in which it was found that the housewife was the owner, and often the sole operator, of a motor vehicle.

Figure 6 indicates the distribution of passenger cars by occupation of the principal operator and by age of vehicle. In nearly all cases reported the owner and principal operator were the same person. Consequently, the term owner is used in these discussions. These data are for the States of Arkansas, Louisiana, Oklahoma and Wisconsin.

It may be noted in figure 6, for the four States combined, that farmers and farm managers owned 20.2 percent of all cars of all year models. The next largest group of car owners was the operatives, semiskilled and unskilled workers, and laborers, with 20.0 percent of the vehicles so reported. Among the individual States there was little variation from this average. Craftsmen and foremen owned 17 percent of all the cars, with a range in the four States from 15 percent in Oklahoma to 20 percent in Louisiana. Store and office clerks owned 10 percent of all cars of all occupational groups, with a range among the four States from 6 percent in Wisconsin to 16 percent in Oklahoma.

As has been demonstrated in past studies, two factors, income and use requirements, seem to have an important bearing on the relative ages of cars owned by workers in various occupational groups. Thus, between 75 and 80 percent of all cars reported driven by traveling salesmen and agents, professionals and semiprofessionals, and proprietors, managers, and officials were postwar models. On the other hand, only 40 to 50 percent of the cars owned by farmers and farm managers, operatives, semiskilled and unskilled workers and laborers, and retired persons had been manufactured since the end of World War II.

Three of the occupational groupings are worthy of comment even though the total car ownership in two of them is relatively unimportant. These are the housewives, others, and occupation not reported classifications. The housewife group reported a considerably higher-than-average percentage of newer cars owned, while both of the other groups reported a much lower-than-average percentage of such vehicles. The explanation of these observed characteristics may be that the housewife group includes a relatively high representation of multi-car families, which are generally found in the higher-income brackets and so can afford to own newer automobiles. The other two groups probably include many students, itinerant workers, and persons of no regular occupation, all of whom generally have low incomes and so cannot afford to own the newer cars.

CHARACTERISTICS OF MOTOR-VEHICLE OPERATORS

Although at the present time the laws of all States and the District of Columbia require

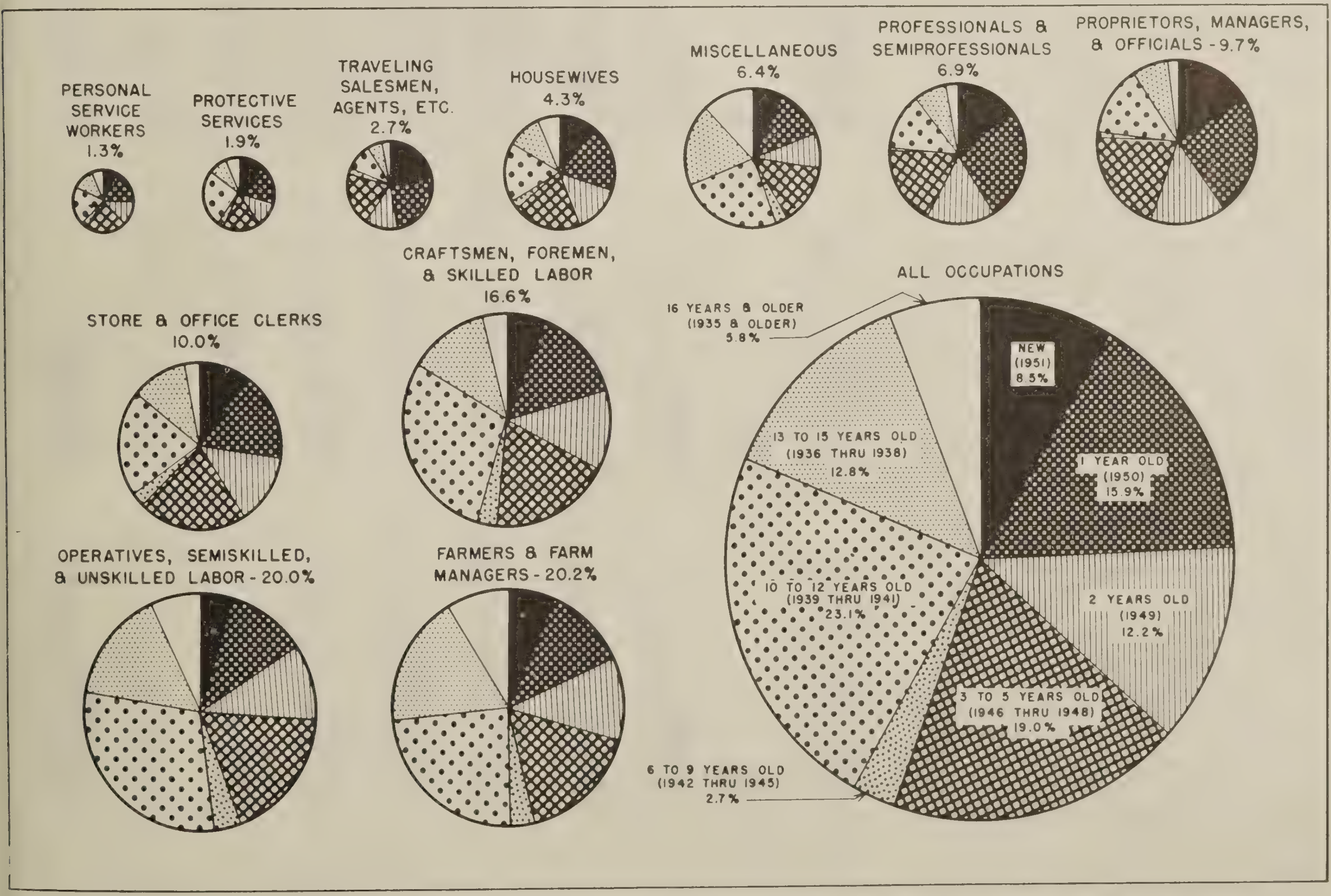

Figure 6.—Passenger cars in use, classified by year model and by occupation of principal operator; summer of 1951, four States.

Table 6.—**Proportion of total population licensed as motor-vehicle operators in each age-sex group for selected places of residence; summer of 1951, five States** [1]

Age	Percentage of total population in each age-sex group licensed as motor-vehicle operators								
	All places			Unincorporated areas			Incorporated places		
	All persons	Female	Male	All persons	Female	Male	All persons	Female	Male
Years	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
14–15	8.1	4.1	11.8	11.1	6.0	15.3	4.9	2.3	7.6
16–20	46.1	26.1	66.1	49.9	26.8	67.8	42.1	25.6	63.9
21–29	65.1	46.5	86.7	67.2	47.4	87.8	63.7	45.9	85.9
30–39	68.6	50.2	87.9	70.5	52.4	88.7	67.3	48.7	87.4
40–49	63.6	43.5	84.4	66.1	42.8	87.8	61.8	43.9	81.9
50–59	52.4	27.3	79.4	56.4	27.9	83.5	49.6	27.0	76.1
60–69	37.9	14.6	61.0	39.6	10.3	63.1	36.7	17.2	59.2
70 and over	18.7	4.4	33.1	18.6	3.4	31.6	18.7	4.9	34.1
Age not reported	47.1	36.9	61.5	40.2	40.6	39.7	48.5	36.2	66.5
All licensed drivers	53.4	34.4	73.5	55.2	34.5	74.3	52.2	34.3	72.8

[1] Arkansas, Louisiana, North Dakota, Oklohama, and Wisconsin.

that operators of motor vehicles be licensed, no such requirement was in effect in South Dakota when the limited motor-vehicle-use study was made in the summer of 1951. As a result, the data about motor-vehicle operators presented in this report are limited to five States: Arkansas, Louisiana, North Dakota, Oklahoma, and Wisconsin.

The data obtained in the five States indicate (table 6) that 53 percent of all persons 14 years old or older residing in those States then had permits to drive automobiles. The highest incidence of permit holders was 69 percent in the 30–39-year age group. These findings, and others discussed subsequently, compare very favorably with the findings of studies made recently in several States by the Automobile Manufacturers Association.[3]

According to the motor-vehicle-use studies, 67 percent of the licensed drivers residing in the five States were males while 33 percent were females.

As shown in table 6 and figure 7, 74 percent of all males over 13 years old living in those States were licensed drivers, while only 34 percent of all females over 13 years old were licensed. Among the individual age groupings the highest incidence of drivers, both men and women, was in the 30–39-year age group, the percentages for the sexes being 88 and 50, respectively. Actually, there was relatively little deviation from these percentage relations in the 21–29 or 40–49 age groups. The percentage of all males 50–59 years of age licensed to drive was only slightly smaller, 79 percent, but the corresponding percentage for females was only 27 percent. The relative percentages of both male and female drivers to corresponding age-group totals were much smaller under 21 and over 59 years of age than for any age group between those limits.

The 14–20-year age groups require special consideration because the percentages of persons within these groups who were licensed to drive automobiles were directly affected by the licensing laws of the individual States. In Arkansas, North Dakota, Oklahoma, and Wisconsin junior driver permits might be obtained at age 14 under certain conditions. Although junior permits were not issued in Louisiana, a regular driver's license might be obtained there at age 15. In North Dakota, Oklahoma, and Wisconsin the minimum age for a regular operator's license was 16; in Arkansas it was 18. Among the five States the percentage of all drivers under 20 years of age ranged from 8 percent in Arkansas and Wisconsin to 14 percent in North Dakota.

The unincorporated areas and the incorporated places reported about the same percentage of male and female drivers of total male and female population for all age groups combined as was reported for all population groups. With few exceptions, only minor variations may be noted among the various age groups. The percentage of drivers 14 and 15 years of age was more than twice as high in the unincorporated areas as in the incorporated places. In almost every age group the percentages of drivers, both male and female, were a little higher in the unincorporated areas than in the incorporated places.

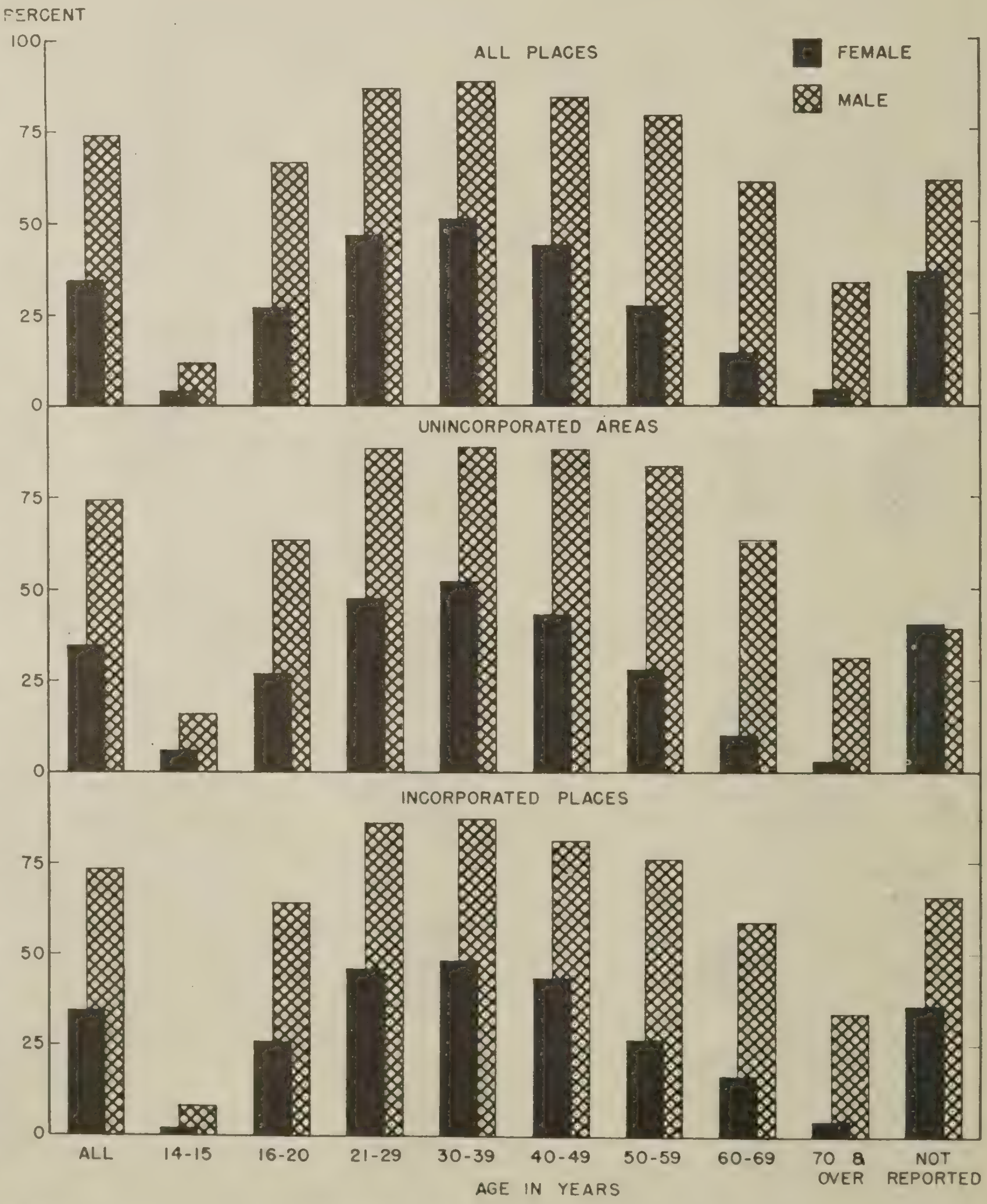

Figure 7.—Proportion of total population in each age-sex group licensed as motor-vehicle operators, for selected places of residence; summer of 1951, five States.

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[3] For some results of these studies see *Automobile Facts and Figures*, 33rd ed., 1953, p. 36. Automobile Manufacturers Association, Detroit, Mich.

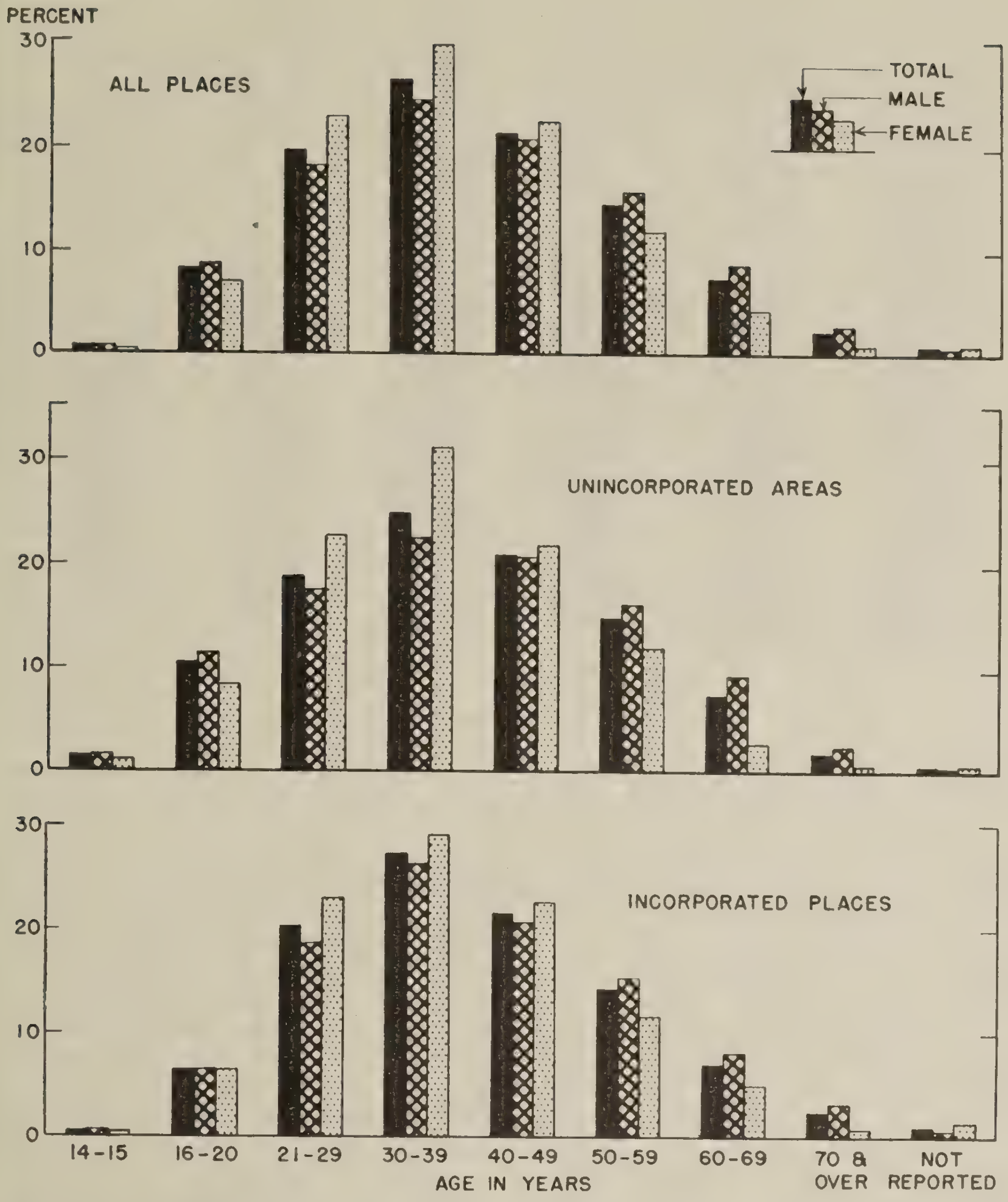

Figure 8.—Age distribution of licensed motor-vehicle operators for each sex group, for selected places of residence; summer of 1951, five States.

Table 7.—Percentages of gainfully-employed persons who travel to work,[1] classified by occupation; summer of 1951, six States [2]

Occupational group	Number of gainfully employed workers [3]	Percentage traveling to work [1]
Professionals and semiprofessionals	246, 820	88. 7
Proprietors, managers, and officials	284, 667	81. 0
Farmers and farm managers	1, 004, 119	9. 2
Store and office clerks, salesmen, etc	505, 784	95. 7
Traveling salesmen, agents, etc	54, 455	88. 5
Craftsmen, foremen, skilled laborers, etc	512, 983	94. 3
Operatives, semiskilled and unskilled workers, and laborers	894, 809	86. 9
Protective services	61, 823	73. 5
Personal-service workers	180, 612	88. 0
All occupations [3]	3, 746, 072	67. 8

[1] Including walking.

[2] Arkansas, Louisiana, North Dakota, Oklahoma, South Dakota, and Wisconsin.

[3] Excludes "occupation not reported" and those for which the method of travel was not reported.

Some of the characteristics already mentioned are placed in a different perspective in figure 8. For all population groups combined in the five States, over 26 percent of all drivers of all ages were between 30 and 39 years of age. About 30 percent of all female drivers and 24 percent of all male drivers were in this age group. It may be noted also that 75 percent of all female drivers and 63 percent of all male drivers were between 21 and 49 years of age. In the 14–20-year age groups, the percentage of male and female drivers were reported as 9 and 7 percent, respectively.

The distribution of all drivers in the unincorporated areas reflects the influence of the importance of the motor vehicle to the rural areas. A considerably higher percentage of younger motor-vehicle operators was reported for the unincorporated areas than for the incorporated places: In the unincorporated areas 11 percent of all drivers were under 21 years of age as compared with 7 percent in all incorporated places. At the other extreme, the percentage of drivers over 60 years of age did not vary markedly between the unincorporated areas and the incorporated places.

TRAVEL TO AND FROM WORK

Most employed persons find it necessary to travel to and from their places of employment, thereby producing the rush-hour traffic congestion found in urban areas. Travel to and from work was the cause of more than 30 percent of the trips and over 20 percent of the mileage traveled by the average private automobile. Because of the importance of this segment of passenger travel, and its bearing on many aspects of the provision of highway facilities, it was given rather extensive consideration in the motor-vehicle-use studies.

Table 7 indicates, for the six States covered in this report, the total number of gainfully employed persons in each occupational group and the percentages traveling between their homes and their places of employment. (In general, in this report, walking is included among the modes of travel to and from work.) It will be noted that 68 percent of all workers in all occupational groups combined came into this category; the remaining 32 percent worked at their places of residence. As would be expected, only 9 percent of the farmers and farm managers traveled to work; a far lesser proportion than for any other group.

Modes of Travel to and from Work

Figure 9 and table 8 indicate the extent of use of various modes of travel by workers residing in each of the various population groups. As used here, the term public transportation includes all types of carriers, such as city transit lines, intercity bus lines, and railroads. However, transportation by truck or bus provided by the employer would be classified under other means, as would, for example, travel to and from work by motorcycle or bicycle, or in a truck owned by the worker.

For all population groups combined, 61 percent of the workers used passenger cars alone for home-to-work travel. Among the population groups, the range was from 46 percent in incorporated places having a population of 100,000 or over to 73 percent in unincorporated areas. The next most common means of travel was walking, with 16 percent of all persons walking to and from work. The smallest proportion of walkers, as one might expect, was in the unincorporated areas (8 percent); the largest was in incorporated places having a population under 5,000 (27 percent). Use of public transportation alone was the highest, 38 percent, in the places having a population of 100,000 or over and lowest, 2 percent, in places under 5,000. This is about what would be expected—the larger the place, the more important would be the public transportation system. Trips in which both public transportation and automobiles were used in combination amounted to less than 2 percent.

Relation Between Distance to Work and Mode of Travel

It is generally recognized that there is a definite relation between distance from home to work and mode of travel used in getting to and

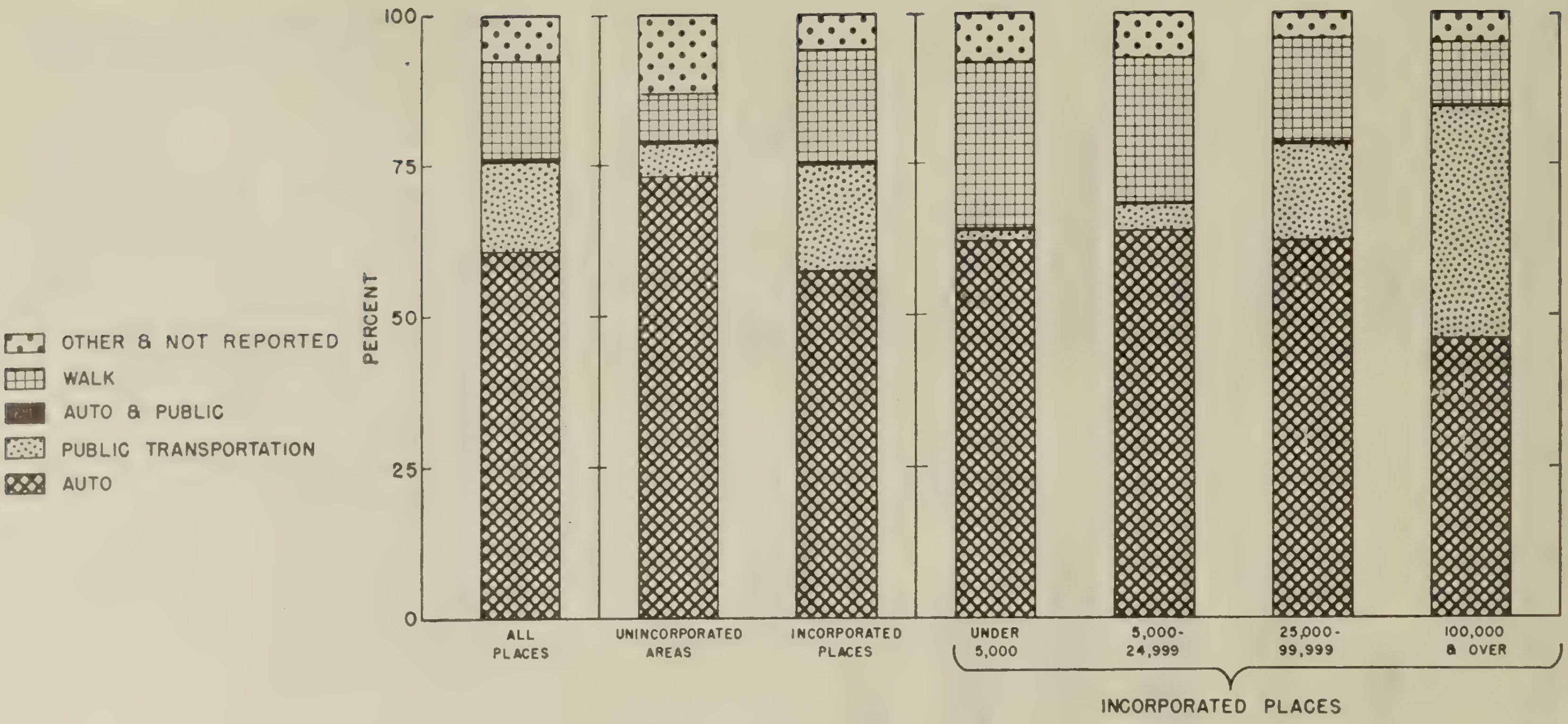

Figure 9.—Gainfully-employed workers in each population group using various modes of home-to-work travel; summer of 1951, six States.

Table 8.—Percentages of gainfully-employed workers in each population group using various modes of home-to-work travel; summer of 1951, six States [1]

Population group	Number of workers	Percentage of workers, by mode of travel						
		All modes of travel	Passenger cars	Public transportation	Passenger cars and public transportation	Walk	All other means	Method not reported
		Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Unincorporated areas	591, 746	100. 0	73. 3	5. 3	1. 8	8. 1	6. 2	5. 3
Incorporated places:								
Under 5,000	496, 177	100. 0	62. 6	1. 6	1. 1	27. 4	3. 5	3. 8
5,000–24,999	476, 151	100. 0	64. 4	4. 2	. 9	24. 2	2. 1	4. 2
25,000–99,999	446, 554	100. 0	62. 8	15. 7	. 9	17. 2	1. 8	1. 6
100,000 and over	715, 907	100. 0	46. 4	38. 4	2. 2	9. 9	1. 3	1. 8
Subtotal	2, 134, 789	100. 0	57. 6	17. 5	1. 4	18. 7	2. 0	2. 8
All places	2, 726, 535	100. 0	61. 0	14. 8	1. 5	16. 4	3. 0	3. 3

[1] Arkansas, Louisiana, North Dakota, Oklahoma, South Dakota, and Wisconsin.

from work—a hypothesis supported by these motor-vehicle-use studies.

Table 9 presents the combined findings of the six State studies reported upon. For all population groups except incorporated places having populations under 5,000 inhabitants, more persons who lived less than a mile from their places of employment walked to work than traveled by any other means. However, when the distance to work was 1 mile or more, the percentage of workers traveling to and from their jobs entirely by automobile exceeded 68 percent in all cases except in cities having populations of 100,000 inhabitants or more, where the percentage was 40. Of all persons walking to work, 85 percent lived within 1 mile and more than 99 percent within 3 miles of their work.

Public transportation was relied upon more heavily by workers living in cities having 25,000 or more inhabitants than by those residing elsewhere. About 17 percent of workers living in places having populations of 25,000–100,000 traveled from home to work by public transportation for all or part of their trips; for cities of 100,000 or more inhabitants the comparable percentage was 41. However, in both classes of places it was the workers who lived from 1 to 5 miles from their jobs who relied most heavily upon public transportation in getting to and from work.

Distribution of Workers Using Automobiles

In the six States reported upon, about 65 percent of all persons using automobiles in going to and from their jobs traveled 5 miles or less one way on such trips (fig. 10). Conversely, only 8 percent traveled 20 miles or more each way between their homes and places of employment.

In all of the frequency distributions shown in figure 10, the great proportion of trips were in the shortest distance ranges, except for the unincorporated areas and the cities having populations in excess of 100,000. The significance of these relations becomes more apparent when they are considered along with the relations shown in figure 9. People who live in unincorporated areas and incorporated places having populations of less than 25,000 relied very little upon public transportation as a means of getting to and from work. Therefore, most residents of such areas who traveled to and from work either walked or else drove or rode in automobiles. In the medium-sized cities (25,000–100,000 inhabitants) public transportation was an important factor but, probably because of the relatively short distances involved, its effect seemed to be mainly to reduce the percentage of walkers rather than that of automobile users. Only in the larger cities (those having population of 100,000 or more) did public transportation become a major factor in transporting workers; here the percentage of workers using automobiles was at its lowest level. Even in these larger places, however, the percentage of workers traveling by automobile (46 percent) exceeded the percentage using mass transportation for the entire trip or in combination with auto travel (total of 41 percent).

In figure 10 the total number of automobile users represents nearly 75 percent of all workers living in unincorporated areas requiring home-to-work travel, about 62 to 64 percent of such workers living in incorporated places having populations of less than 100,000, and 46 percent of such workers living in larger places.

Workers living in unincorporated areas include both those living in suburban sections and those living in rather remote open-country areas. It was not unexpected, therefore, to find that 55 percent of these workers who go to and from work by automobile traveled more than 5 miles one way, or that 11 percent of them traveled 25 miles or more one way.

Although a goodly number of workers living in incorporated places having less than 5,000 inhabitants worked elsewhere, as was evidenced by the more than 8 percent who traveled more than 25 miles by car to their jobs, nearly two-thirds of the automobile users worked within 5 miles of their homes, and 40 percent within 1 mile of home. In the next larger class of places, only 3 percent of the workers traveled over 25 miles to their jobs, while 78 percent traveled less than 5 miles—indicating, it would seem, that these communities were much more self-contained than the smaller places.

Only 1.5 percent of automobile users living in places having populations of 100,000 or more traveled 25 miles or more to work. On the other hand, while 65 percent reported traveling less than 5 miles to work, only 20 percent traveled less than 2 miles. Evidences of the effects of larger area and increased use of public transportation for short trips appear to be present.

Relation of Occupation and Mode of Travel to Work

Two factors might be expected to have an important bearing upon whether or not workers in various occupational groups would be likely to use automobiles in traveling between home and work: The need for a car on the job, and the nature of the individual occupational group.

Table 10 indicates the relative distribution of modes of travel used in going to and from their jobs by workers in the various occupational groups, as shown by the findings of motor-vehicle-use studies made in the six States. In all but one of the five classes of places, traveling salesmen and agents used automobiles more than any other occupational group. The one exception was the proprietor, manager, and official group in the cities having a population of 100,000 or more. Most traveling salesmen and agents, of course, find it necessary to use automobiles in connection with their work.

In the four groups of places where traveling salesmen and agents led in the percentage of workers using automobiles, the proprietor, manager, and official group was second in two, while the craftsmen, foremen, and skilled laborers group was second in one and the protective-service group was second in the other.

The personal-service worker group was lowest in percentage of car use in all population groups.

Table 9.—Distribution of gainfully-employed workers traveling from home to work, classified by mode of travel within each distance group for all places of residence; summer of 1951, six States[1]

Population group and one-way distance	Number of workers [2]	Distribution of workers, by mode of travel					
		All modes of travel	Passenger car	Public transportation	Passenger car and public transportation	Walk	All other means and not reported
Miles							
All places:		*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
0.1–0.9	690, 176	100. 0	42. 9	3. 3	. 7	50. 5	2. 6
1.0–1.9	425, 162	100. 0	66. 5	18. 3	1. 3	12. 0	1. 9
2.0–2.9	292, 710	100. 0	65. 4	28. 5	1. 1	2. 5	2. 5
3.0–4.9	371, 195	100. 0	65. 7	28. 6	2. 2	. 4	3. 1
5.0–9.9	340, 541	100. 0	77. 0	18. 4	1. 6	. 4	2. 6
10.0–19.9	204, 492	100. 0	84. 1	9. 5	2. 3	------	4. 1
20 and over	136, 358	100. 0	84. 5	6. 1	2. 7	------	6. 7
Not reported	265, 901	100. 0	37. 7	9. 1	1. 4	13. 9	37. 9
All distances	2, 726, 535	100. 0	61. 0	14. 8	1. 5	16. 4	6. 3
Unincorporated areas:							
0.1–0.9	65, 639	100. 0	41. 9	. 8	1. 8	52. 2	3. 3
1.0–1.9	42, 154	100. 0	72. 7	1. 6	5. 9	13. 9	5. 9
2.0–2.9	55, 725	100. 0	85. 3	3. 7	------	5. 6	5. 4
3.0–4.9	85, 412	100. 0	89. 5	4. 3	. 5	. 3	5. 4
5.0–9.9	117, 089	100. 0	82. 8	10. 8	1. 9	. 2	4. 3
10.0–19.9	80, 398	100. 0	81. 1	8. 0	3. 6	------	7. 3
20 and over	71, 177	100. 0	84. 7	5. 8	------	------	9. 5
Not reported	74, 152	100. 0	39. 4	1. 7	2. 3	6. 1	50. 5
All distances	591, 746	100. 0	73. 3	5. 3	1. 8	8. 1	11. 5
All incorporated places:							
0.1–0.9	624, 537	100. 0	43. 0	3. 6	. 6	50. 3	2. 5
1.0–1.9	383, 008	100. 0	65. 8	20. 1	. 9	11. 8	1. 4
2.0–2.9	236, 985	100. 0	60. 8	34. 4	1. 4	1. 7	1. 7
3.0–4.9	285, 783	100. 0	58. 6	35. 9	2. 8	. 4	2. 3
5.0–9.9	223, 452	100. 0	74. 0	22. 4	1. 4	. 5	1. 7
10.0–19.9	124, 094	100. 0	86. 0	10. 5	1. 5	------	2. 0
20 and over	65, 181	100. 0	84. 2	6. 5	5. 7	------	3. 6
Not reported	101, 749	100. 0	37. 0	12. 0	1. 1	16. 9	33. 0
All distances	2, 134, 789	100. 0	57. 6	17. 5	1. 4	18. 7	4. 8
Incorporated places under 5,000:							
0.1–0.9	234, 007	100. 0	48. 4	------	. 4	47. 5	3. 7
1.0–1.9	49, 519	100. 0	77. 8	------	------	20. 7	1. 5
2.0–2.9	11, 064	100. 0	86. 5	1. 0	4. 4	3. 0	5. 1
3.0–4.9	21, 634	100. 0	82. 9	5. 1	5. 0	------	7. 0
5.0–9.9	44, 364	100. 0	87. 2	6. 5	1. 6	1. 4	3. 3
10.0–19.9	42, 062	100. 0	90. 3	2. 0	3. 6	------	4. 1
20 and over	33, 398	100. 0	89. 9	3. 9	1. 8	------	4. 4
Not reported	60, 129	100. 0	40. 6	3. 2	. 3	22. 5	33. 4
All distances	496, 177	100. 0	62. 6	1. 6	1. 1	27. 4	7. 3
Incorporated places of 5,000–24,999:							
0.1–0.9	188, 558	100. 0	47. 2	1. 7	. 5	48. 4	2. 2
1.0–1.9	115, 541	100. 0	80. 3	6. 1	1. 8	10. 3	1. 5
2.0–2.9	31, 351	100. 0	80. 5	10. 8	1. 7	2. 0	5. 0
3.0–4.9	19, 661	100. 0	85. 7	10. 6	------	3. 7	------
5.0–9.9	21, 754	100. 0	90. 0	4. 2	2. 4	------	3. 4
10.0–19.9	30, 776	100. 0	95. 2	4. 0	------	------	. 8
20 and over	14, 593	100. 0	90. 0	8. 4	------	------	1. 6
Not reported	53, 917	100. 0	38. 5	1. 5	. 4	19. 7	39. 9
All distances	476, 151	100. 0	64. 4	4. 2	. 9	24. 2	6. 3
Incorporated places of 25,000–99,999:							
0.1–0.9	106, 180	100. 0	38. 8	5. 2	1. 0	53. 0	2. 0
1.0–1.9	119, 120	100. 0	68. 2	17. 9	. 3	12. 0	1. 6
2.0–2.9	89, 032	100. 0	71. 0	26. 2	. 5	1. 5	. 8
3.0–4.9	54, 456	100. 0	73. 5	23. 1	------	. 8	2. 6
5.0–9.9	34, 868	100. 0	87. 3	8. 6	1. 0	1. 3	1. 8
10.0–19.9	12, 517	100. 0	87. 2	6. 7	3. 4	------	2. 7
20 and over	8, 133	100. 0	71. 2	9. 1	15. 6	------	4. 1
Not reported	22, 248	100. 0	34. 5	13. 1	------	17. 9	34. 5
All distances	446, 554	100. 0	62. 8	15. 7	. 9	17. 2	3. 4
Incorporated places of 100,000 and over:							
0.1–0.9	95, 792	100. 0	26. 0	14. 2	1. 1	58. 0	. 7
1.0–1.9	98, 828	100. 0	40. 1	49. 1	. 8	8. 7	1. 3
2.0–2.9	105, 538	100. 0	43. 5	51. 8	1. 7	1. 7	1. 3
3.0–4.9	190, 032	100. 0	48. 7	45. 7	3. 6	----	2. 0
5.0–9.9	122, 466	100. 0	62. 5	35. 2	1. 2	. 1	1. 0
10.0–19.9	38, 739	100. 0	73. 6	25. 9	------	------	. 5
20 and over	9, 057	100. 0	65. 7	10. 6	19. 9	-----	3. 8
Not reported	55, 455	100. 0	32. 7	31. 2	3. 0	7. 8	25. 3
All distances	715, 907	100. 0	46. 4	38. 4	2. 2	9. 9	3. 1

[1] Arkansas, Louisiana, North Dakota, Oklahoma, South Dakota, and Wisconsin.

[2] These numbers differ slightly from those shown in table 10 because this table excludes 36,096 persons for whom occupation was reported but both the method of transportation and the mileage to work were not reported.

DISTRIBUTION OF AUTOMOBILE TRAVEL

Perhaps the most pressing need for the information obtainable in the motor-vehicle-use studies is for data concerning the distribution of motor-vehicle travel by road systems, by type of area or size of place where the travel is performed, and by place of residence of the vehicle user. A consistent tendency for respondents to interviews to under-report travel has been observed in other studies of this nature. Consequently, it can be expected that a tendency for some under-reporting of trip data will occur in these studies, with the result that the total vehicle-miles traveled may be somewhat understated. It is believed, however, that the percentage distribution of travel will be reasonably representative of the characteristics of the total amount of travel performed.

Since the travel information available for this preliminary report includes data from only four States in the central region of the United States, it quite probably does not adequately represent the United States as a whole, particularly in the rural and urban travel distribution, and should be considered in that light. It does, however, give a picture of the type of information collected.

Distribution by Place of Travel

Rural roads.—The main rural roads (primary State highways) carried about one-half of the automobile travel of both rural and urban residents, as shown in figure 11 and table 11. About 49 percent of the total automobile travel performed by residents of un-

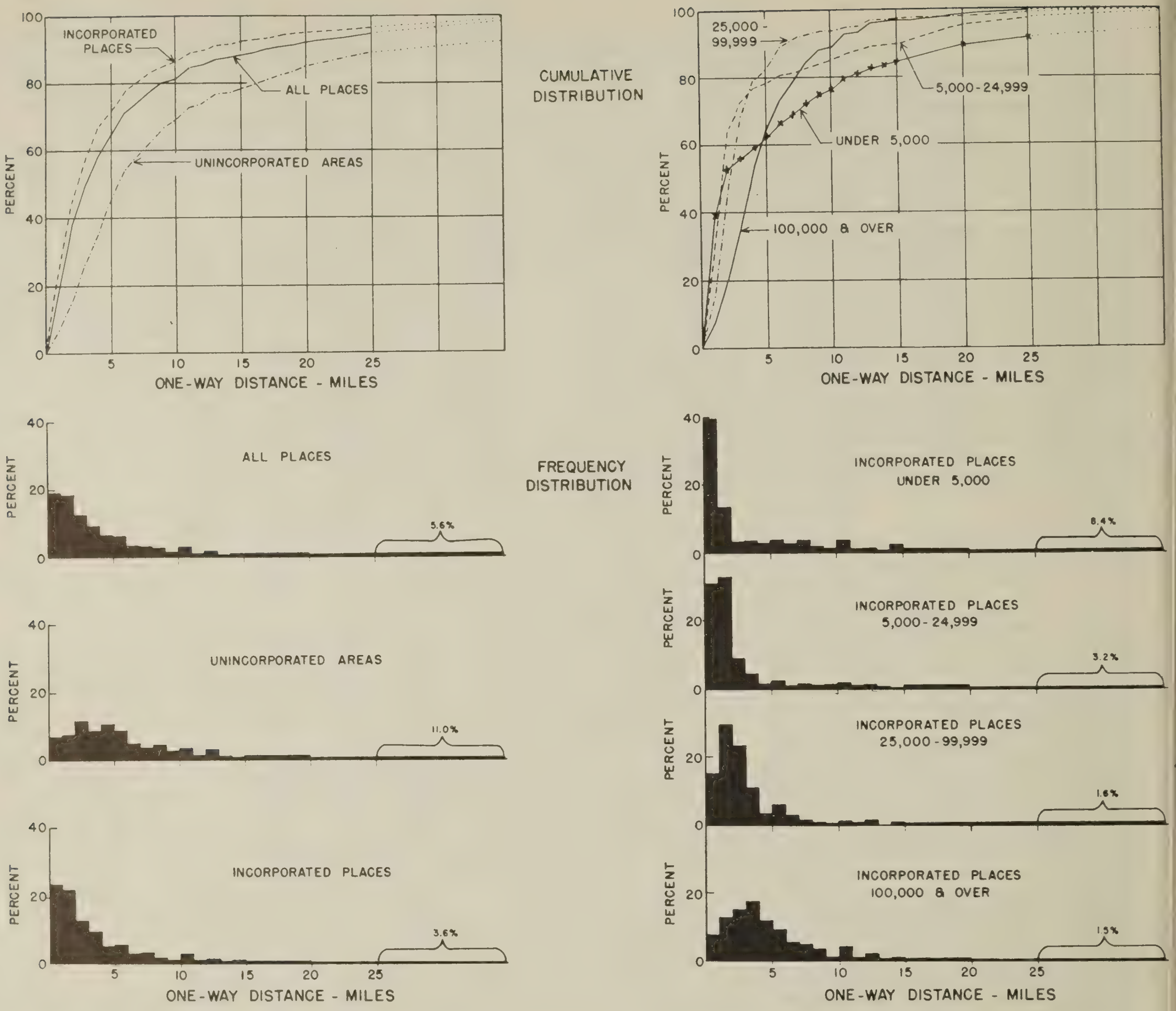

Figure 10.—Gainfully-employed workers using passenger cars for home-to-work travel, classified by distance to place of employment and by place of residence; summer of 1951, six States.

incorporated areas and 47 percent of the total travel performed by residents of incorporated places in these States occurred on the primary rural-road system within the State of residence. This percentage varied from a low of 33 percent for residents of cities having a population of 100,000 or more to a high value of 59 percent for those living in places with a population of less than 5,000.

Among the individual States the range in passenger-car travel between main rural roads and other rural roads varied somewhat, primarily because of differences in the proportionate extent of rural-road mileages in the primary highway systems of these States. This variation ranged from 40 percent for the State primary roads of Louisiana to 69 percent in Arkansas. The local rural-road travel varied in opposite order, from 7 percent in Arkansas to 31 percent in Louisiana. This, of course, may be explained by the fact that the primary rural-road mileage of Louisiana amounted to only 6 percent of the total rural-road mileage of the State, whereas 14 percent of the rural roads in Arkansas were on the State primary-road system.

Residents of the unincorporated areas used the local rural-road system of their States proportionately more than the urban residents: 32 percent of their automobile travel was on local roads as compared with 7 percent for residents of all incorporated places. This use of local roads by residents of incorporated places varied from a high of 13 percent for residents of the smaller places to 3 percent for those living in the larger cities.

City streets.—As would be expected, urba residents drove their cars on the streets in th incorporated places within the State o residence (36 percent of their travel) to a muc larger extent than did the rural residents (1 percent). In the incorporated places, th range was from 21 percent for residents o cities having a population under 5,000 to 5 percent in the cities having a population o 100,000 or more.

In considering the travel performed in th incorporated places within the State by th residents of these States, it may be noted fro figure 12 and table 12 that slightly over one half of the passenger-car travel within thes places resulted from trips confined entirel within cities. The percentage of city trav represented by trips entirely within citie varied from 18 percent in the cities having a population of less than 5,000 to 75 percent in the cities having a population of 100,000 or more. It will be noted in table 12 that the variation from State to State was relatively small within each of the population groups.

Total travel.—Of all travel by passenger cars in these four States, 71 percent was in the unincorporated areas and 29 percent in the incorporated places, as shown in table 11 and figure 11. Among the individual States, the range for travel in incorporated places was from 24 percent for Arkansas to 30 percent for Louisiana and Oklahoma.

Out-of-State travel.—Approximately 8 percent of the travel performed by residents of these four States was on roads and city streets in other States. Among individual States, there was very little variation in the percentage of out-of-State travel.

Occupational Distribution of Automobile Travel

Approximately one-half—ranging from 43 percent to 53 percent—of the total passenger-car travel of each occupational group was performed on the primary highways within the State of residence, as shown in figure 13 and table 13.

Farmers and farm managers reported 37 percent of their driving on other rural roads within the State of residence—far more than the 9 to 19 percent for the various other occupational groups.

The farmers and farm managers drove only 13 percent of their total in-State mileage on streets in incorporated places. As a result of their low proportion of city driving and their relatively high proportion of driving on other rural roads, they had about the same proportion of travel on the primary highways as all other occupational groups.

Three groups—professionals and semiprofessionals, proprietors, managers, and officials, and store and office clerks and salesmen—performed a greater proportion of travel outside of their State of residence than did the other occupational groups, reporting out-of-State travel of about 11 percent. Farmers and farm managers and miscellaneous (including retired persons, other unclassified occupations, and occupations not reported), reported that less than 3 percent of all their travel was outside the State of residence. The other occupational groups showed a range from 5 to 9 percent.

Figure 14 shows the distribution of travel and the number of automobiles by occupational groupings for each place of residence of principal operator. For all population groups combined, five of the eleven occupational groups traveled a higher percentage of the total vehicle-miles than the corresponding proportion of automobiles owned by these people. For instance, the professional and semiprofessional group traveled 10 percent of all the vehicle-miles while operating only 7 percent of the cars.

The relative distributions among occupational groups for each of the four groups of

Table 10.—Distribution of gainfully employed workers traveling from home to work, classified by mode of travel within each occupation group for each place of residence; summer of 1951, six States [1]

Residence and occupational group	Number of workers [2]	Distribution of workers, by mode of travel					
		All modes of travel	Passenger car	Public transportation	Passenger car and public transportation	Walk	All other means and not reported
		Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
All places:							
Professionals and semiprofessionals	230,098	100.0	65.2	11.2	0.9	16.8	5.9
Proprietors, managers, officials [3]	334,062	100.0	73.7	3.2	.8	14.4	7.9
Store and office clerks, salesmen	492,892	100.0	59.3	18.6	2.0	17.4	2.7
Traveling salesmen, agents, etc	49,599	100.0	82.6	5.9	1.9	4.6	5.0
Craftsmen, foremen, skilled laborers	494,260	100.0	71.7	11.2	1.3	10.2	5.6
Operatives, workers, and laborers	805,015	100.0	59.3	14.7	1.5	16.8	7.7
Protective services	53,379	100.0	66.0	8.3	2.0	8.2	15.5
Personal-service workers	173,857	100.0	22.5	34.4	.6	32.0	10.5
Miscellaneous	8,516	100.0	74.9	5.7	------	15.8	3.6
Occupation not reported	120,953	100.0	15.4	32.1	3.1	21.2	28.2
All occupations	2,762,631	100.0	61.0	14.8	1.5	16.4	6.3
Unincorporated areas:							
Professionals and semiprofessionals	30,385	100.0	78.0	4.6	------	6.5	10.9
Proprietors, managers, officials [3]	95,435	100.0	67.2	.2	.6	17.7	14.3
Store and office clerks, salesmen	68,953	100.0	83.1	5.6	1.0	5.0	5.3
Traveling salesmen, agents, etc	3,457	100.0	90.5	------	------	------	9.5
Craftsmen, foremen, skilled laborers	106,953	100.0	85.7	2.9	.8	2.3	8.3
Operatives, workers, and laborers	224,008	100.0	75.5	1.2	3.0	6.4	13.9
Protective services	14,073	100.0	60.8	2.8	------	2.8	33.6
Personal-service workers	16,770	100.0	48.0	5.2	------	19.0	27.8
Miscellaneous	1,478	100.0	50.0	------	------	36.9	13.1
Occupation not reported	43,856	100.0	10.4	49.7	5.0	13.7	21.2
All occupations	605,368	100.0	73.3	5.3	1.8	8.1	11.5
All incorporated places:							
Professionals and semiprofessionals	199,713	100.0	63.3	12.3	1.0	18.3	5.1
Proprietors, managers, officials [3]	238,627	100.0	76.3	4.4	.9	13.1	5.3
Store and office clerks, salesmen	423,939	100.0	55.4	20.7	2.2	19.5	2.2
Traveling salesmen, agents, etc	46,142	100.0	82.0	6.3	2.1	5.0	4.6
Craftsmen, foremen, skilled laborers	387,307	100.0	67.8	13.4	1.5	12.4	4.9
Operatives, workers, and laborers	581,007	100.0	53.0	19.9	.9	20.8	5.4
Protective services	39,306	100.0	67.9	10.3	2.7	10.1	9.0
Personal-service workers	157,087	100.0	19.7	37.5	.7	33.4	8.7
Miscellaneous	7,038	100.0	80.2	6.9	------	11.4	1.5
Occupation not reported	77,097	100.0	18.3	22.1	2.1	25.5	32.0
All occupations	2,157,263	100.0	57.6	17.5	1.4	18.7	4.8
Incorporated places under 5,000:							
Professionals and semiprofessionals	50,900	100.0	61.1	1.2	------	26.7	11.0
Proprietors, managers, officials [3]	85,266	100.0	71.1	.3	1.4	18.0	9.2
Store and office clerks, salesmen	80,660	100.0	59.7	3.3	1.3	32.0	3.7
Traveling salesmen, agents, etc	6,070	100.0	74.3	------	------	18.4	7.3
Craftsmen, foremen, skilled laborers	85,832	100.0	69.4	1.4	1.2	18.2	9.8
Operatives, workers, and laborers	149,181	100.0	61.0	2.3	1.4	28.4	6.9
Protective services	5,460	100.0	64.4	------	------	29.5	6.1
Personal-service workers	27,375	100.0	26.6	------	------	56.5	16.9
Miscellaneous	843	100.0	87.2	------	------	------	12.8
Occupation not reported	14,165	100.0	24.7	------	------	39.1	36.2
All occupations	505,752	100.0	62.6	1.6	1.1	27.4	7.3
Incorporated places of 5,000–24,999:							
Professionals and semiprofessionals	44,053	100.0	67.1	3.5	1.2	25.9	2.3
Proprietors, managers, officials [3]	54,697	100.0	84.0	.8	------	11.5	3.7
Store and office clerks, salesmen	104,974	100.0	67.3	4.3	1.0	25.5	1.9
Traveling salesmen, agents, etc	8,838	100.0	90.4	1.3	------	7.0	1.3
Craftsmen, foremen, skilled laborers	88,078	100.0	71.9	3.4	1.4	17.8	5.5
Operatives, workers, and laborers	120,115	100.0	60.2	5.3	.6	27.4	6.5
Protective services	10,042	100.0	80.3	1.1	------	9.6	9.0
Personal-service workers	27,777	100.0	21.6	11.5	2.6	51.5	12.8
Miscellaneous	1,665	100.0	100.0	------	------	------	------
Occupation not reported	18,951	100.0	6.1	3.5	------	32.2	58.2
All occupations	479,190	100.0	64.4	4.2	.9	24.2	6.3
Incorporated places of 25,000–99,999:							
Professionals and semiprofessionals	39,276	100.0	65.7	13.8	.5	16.8	3.2
Proprietors, managers, officials [3]	46,045	100.0	77.0	7.3	1.0	12.6	2.1
Store and office clerks, salesmen	73,928	100.0	51.3	22.5	1.6	21.3	3.3
Traveling salesmen, agents, etc	17,896	100.0	93.5	------	2.4	1.2	2.9
Craftsmen, foremen, skilled laborers	82,707	100.0	76.3	9.0	1.4	10.5	2.8
Operatives, workers, and laborers	129,434	100.0	58.9	15.9	.3	20.8	4.1
Protective services	10,272	100.0	78.5	11.3	------	6.0	4.2
Personal-service workers	25,649	100.0	44.0	23.8	.8	18.1	13.3
Miscellaneous	3,037	100.0	66.1	13.1	------	20.8	------
Occupation not reported	23,392	100.0	16.3	39.6	------	29.8	14.3
All occupations	451,636	100.0	62.8	15.7	.9	17.2	3.4
Incorporated places of 100,000 and over:							
Professionals and semiprofessionals	65,484	100.0	60.9	25.9	2.1	7.7	3.4
Proprietors, managers, officials [3]	52,619	100.0	76.3	12.5	1.0	7.7	3.1
Store and office clerks, salesmen	164,377	100.0	47.5	38.8	3.6	8.6	1.5
Traveling salesmen, agents, etc	13,338	100.0	64.6	21.1	4.0	2.5	7.8
Craftsmen, foremen, skilled laborers	130,689	100.0	58.7	30.9	1.8	6.2	2.4
Operatives, workers, and laborers	182,278	100.0	37.6	46.5	1.1	10.4	4.4
Protective services	13,532	100.0	51.9	20.4	8.0	5.8	13.9
Personal-service workers	76,286	100.0	8.4	65.1	.1	23.8	2.6
Miscellaneous	1,493	100.0	82.7	5.9	------	11.4	------
Occupation not reported	20,589	100.0	27.3	34.5	7.7	5.2	.25.3
All occupations	720,685	100.0	46.4	38.4	2.2	9.9	3.1

Arkansas, Louisiana, North Dakota, Oklahoma, South Dakota, and Wisconsin.

[2] These numbers differ slightly from those shown in tables 8 and 9 because this table includes 36,096 persons for whom occupation was reported, but both the method of transportation and the mileage to work were not reported.

[3] Includes farmers and farm managers requiring home-to-work travel.

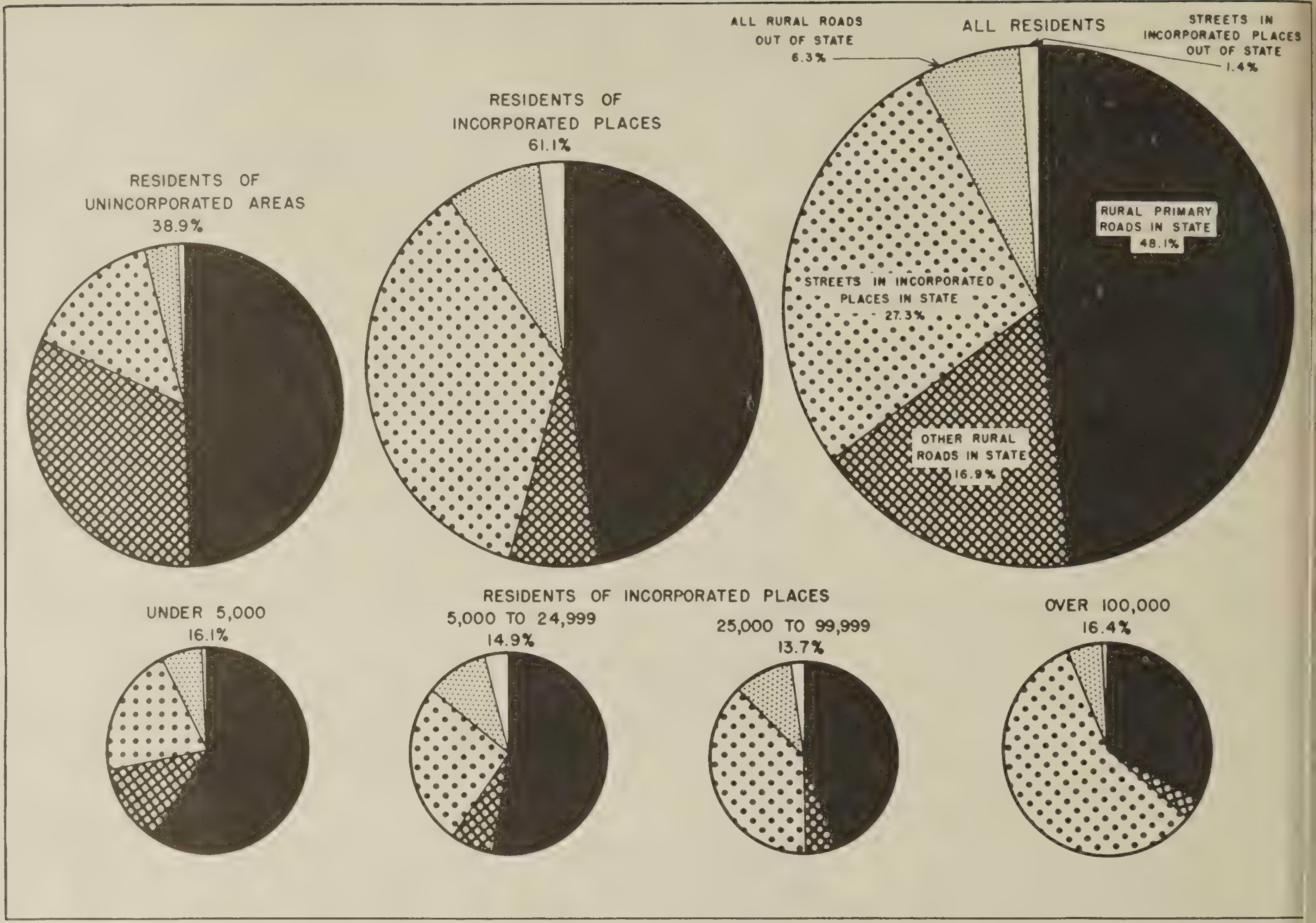

Figure 11.—Passenger-car travel classified by place of travel and by residence of operator; summer of 1951, four States.

Table 11.—Distribution of passenger-car travel classified by place of travel and by residence of principal operator; summer of 1951, four States [1]

Place of travel	Distribution of passenger-car travel by place of travel, according to residence of principal operator						
	All population groups	Unincorporated areas	Incorporated places with population of—				
			All places	Under 5,000	5,000–24,999	25,000–99,999	100,000 and over
All travel:							
Unincorporated areas:	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Primary highways	54.2	52.9	55.1	65.5	62.8	55.1	37.9
Other rural roads	17.1	32.4	7.3	13.3	7.5	5.0	3.2
Subtotal	71.3	85.3	62.4	78.8	70.3	60.1	41.1
Incorporated places	28.7	14.7	37.6	21.2	29.7	39.9	58.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
In State of residence:							
Unincorporated areas:							
Primary highways	48.1	49.4	47.3	59.2	52.8	45.0	32.6
Other rural roads	16.9	32.3	7.1	13.0	6.9	4.9	3.1
Subtotal	65.0	81.7	54.4	72.2	59.7	49.9	35.7
Incorporated places	27.3	14.2	35.7	20.5	26.0	37.3	58.1
Total	92.3	95.9	90.1	92.7	85.7	87.2	93.8
Outside State of residence:							
Unincorporated areas:							
Primary highways	6.1	3.5	7.8	6.3	10.0	10.1	5.3
Other rural roads	.2	.1	.2	.3	.6	.1	.1
Subtotal	6.3	3.6	8.0	6.6	10.6	10.2	5.4
Incorporated places	1.4	.5	1.9	.7	3.7	2.6	.8
Total	7.7	4.1	9.9	7.3	14.3	12.8	6.2

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[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.

incorporated places were very similar. T distribution for unincorporated areas vari more widely because of the large number farmers and farm managers, who owned percent of all cars but drove only 39 perc of the total travel.

From figure 14 it may be deduced t where the bars indicating percentage of tra and percentage of vehicles in use are of eq length, the vehicle operators drove about average miles for the entire sample; where travel bar is the shorter of two, the amo of travel was less than the average; and wh the travel bar is the longer, the amount travel was above the average. Since the d in this report are based primarily on stu covering only one season of the year, fig on the average annual miles traveled vehicle are omitted.

AUTOMOBILE TRIP-LENGTH CHARACTERISTICS

Automobile trips were found to be dominantly short-distance travel, that trips having one-way trip length of less t five miles. The trip-length analyses of iginal road-use studies,[4] which excluded ose trips entirely within incorporated places, owed that about 38 percent of the trips ere under 5 miles in length. As indicated figure 15 and table 14, the present studies, hich include trips entirely within the incor-rated places, show that 62 percent of all ssenger-car trips were less than 5 miles in ngth; 81 percent were less than 10 miles in ngth. The average length of all trips in ese four States was 8.3 miles.

While distributions of travel by trip length ere not developed for all the States in the rly analyses of the motor-vehicle-use data, two States—Louisiana and Oklahoma— pproximately 13 percent of the passenger-car avel was found to result from the large umber of trips of less than 5 miles in length. lmost one-half of the travel resulted from ips 30 miles or greater in length. This in-rmation is shown in table 15.

istribution by Place of Residence

It may be seen in figure 15 that the short assenger-car trips predominate in all popula-on groups. The residents of unincorporated reas performed a slightly lesser proportion their trips in the under-5-mile-length cate-ory, but they still accounted for 48 percent the total. The highest percentage of trips the second category, 5–9 miles in length, as performed by the residents of the unin-orporated areas. All of the places of resi-ence showed nearly the same proportion— om 76 to 88 percent—for all passenger-car ips of less than 10 miles in length. Each of e four States reporting data showed a high egree of similarity in the trip-length fre-uency distribution.

Generally, the average length of automobile rips made by residents of the rural areas was lightly greater than for residents of incor-orated places: 9.0 miles for unincorporated nd 7.9 miles for incorporated places.

Among the four States, the average length passenger-car trip for all population groups ombined ranged from 7.9 miles in Wisconsin 9.3 miles in Louisiana.

istribution by Occupational Group

Occupational-group characteristics were ob-ained for passenger-car trips, and are shown figure 16 and table 16. A predominant ccurrence of the short trip is noted in each ccupational group; this is similar to the requency of short trips observed for residents f the various population groups. Farmers nd farm managers and traveling salesmen nd agents had the lowest proportion of trips nder 5 miles—although they still made 50 60 percent of their trips in this length ategory. Farmers had somewhat more trips han other occupations in the 5–9-mile-length roup so that each of the occupational groups ad about the same percentage of trips of ess than 10 miles. The traveling salesmen nd agents reported a slightly greater proportion of the longer trips than did other occupations. It should be noted that the occupational breakdown includes all trips made in vehicles classified according to the occupation of the principal operator and, of course, includes the trips made in that vehicle when other members of the family were driving. For example, if a farmer's wife uses a car of which he is the principal operator, such trips are included in those of the farmer and farm manager group.

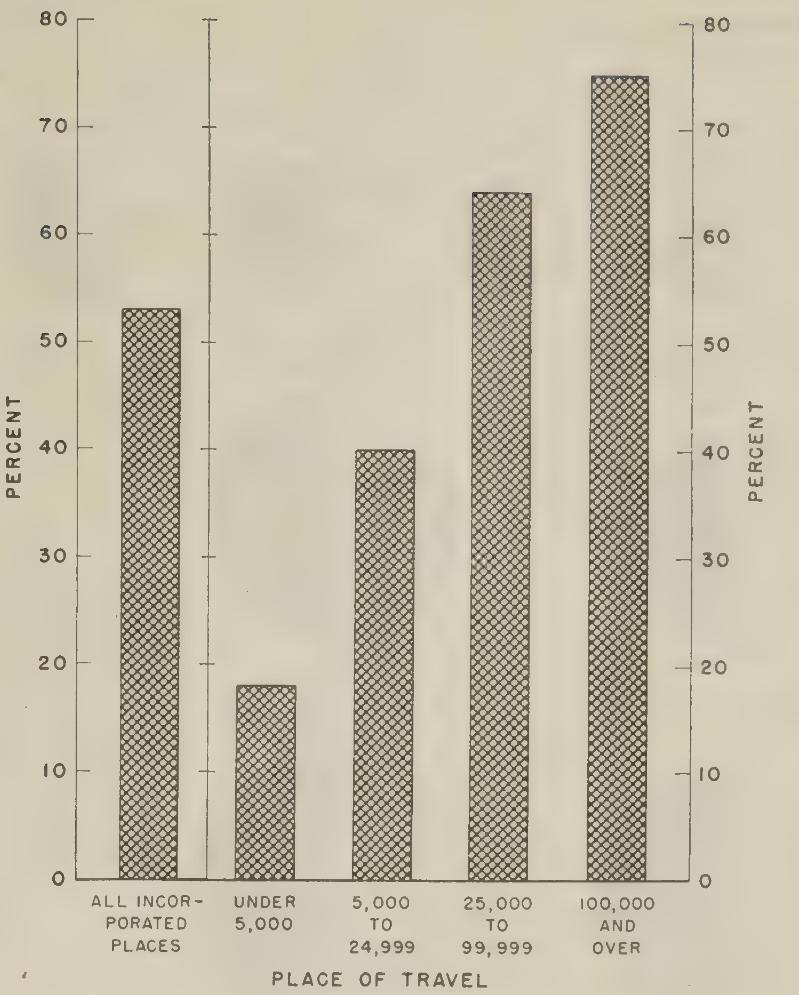

Figure 12.—Proportion of total passenger-car travel in incorporated places by residents of the State resulting from trips confined entirely within these places; summer of 1951, four States.

The average trip length in the various occupational classifications varied from 7.6 miles for store and office clerks and salesmen, personal-service workers, and protective-service workers to 12.2 miles for traveling salesmen and agents. As already indicated, the average trip length for all occupations combined was 8.3 miles.

The occupational group which reported the largest number of trips, 21 percent of the total, was that including operatives and semiskilled and unskilled laborers. It is not surprising to note also that this group owned 20 percent of all cars. The next largest number of trips was reported by craftsmen, foremen, and skilled laborers, where 18 percent were so reported; this occupational group owned 17 percent of all the cars.

Farmers and farm managers reported 16 percent of all the trips and owned 20 percent of all the cars. Here the range among the States was much wider—from 8 percent in Louisiana to 22 percent in Wisconsin. These percentages are in the same ratio as the range in the reported car ownership among the four States.

Generally, it may be said that the percentage of trips in each occupational group was closely related to the percentage of automobiles in these same groups. The higher-salaried workers and traveling salesmen and agents reported more than the average number of trips per car and the farmers and farm managers less than the average number.

Table 12.—Distribution of passenger-car travel in incorporated places by residents of the State, resulting from trips confined entirely within these places, classified by place of travel and State; summer of 1951, four States [1]

Place of travel	Four States	Arkansas	Louisiana ana	Oklahoma	Wisconsin
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Under 5,000	18	16	23	17	17
5,000–24,999	40	43	46	41	36
25,000–99,999	64	77	65	75	60
100,000 and over	75	82	69	80	76
All places	53	55	57	60	48

[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.

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[4] *Preliminary results of road-use studies*, by R. H. Paddock nd R. P. Rodgers. PUBLIC ROADS, vol. 20, No. 3, May 939, p. 49.

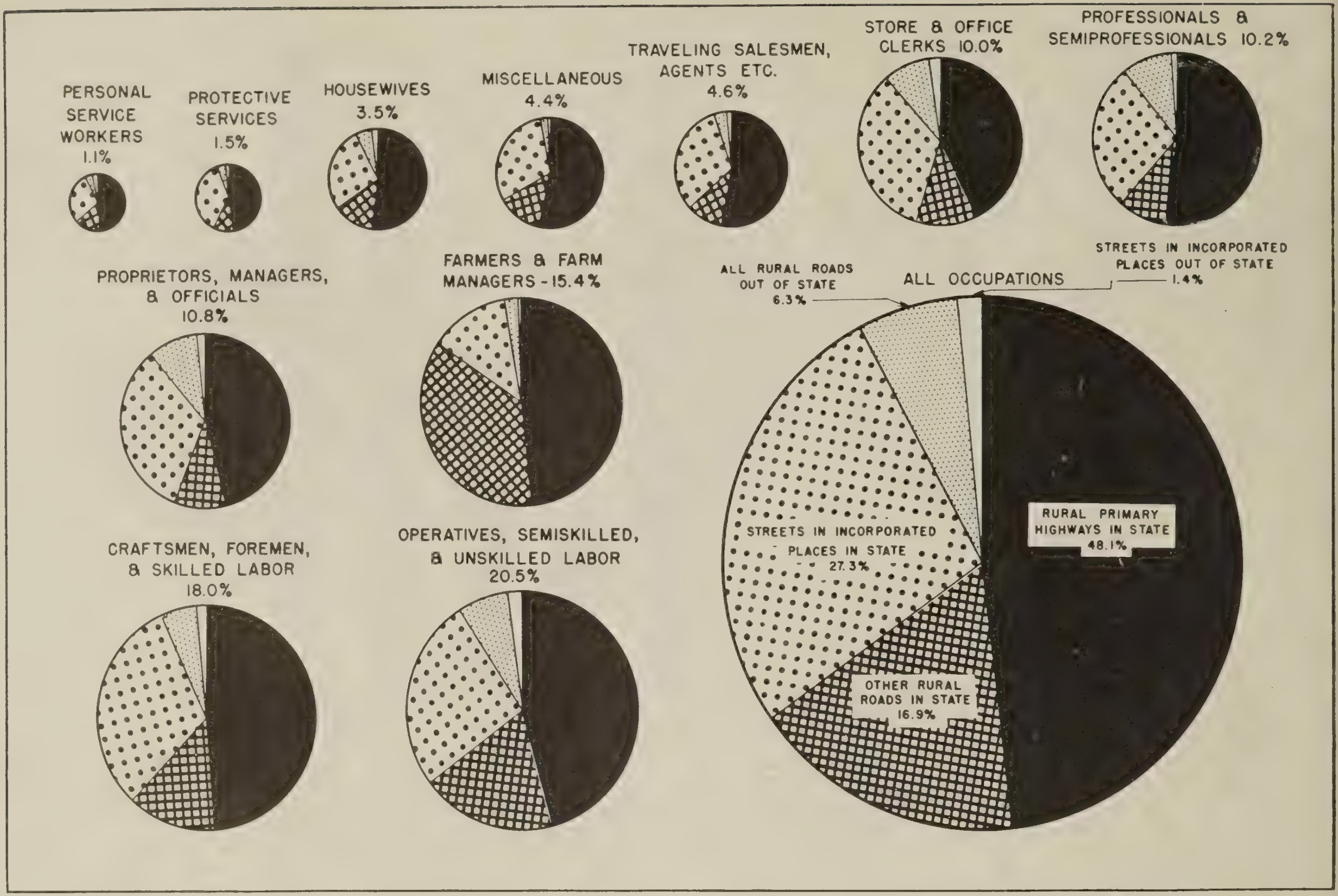

Figure 13.—Passenger-car travel classified by place of travel and by occupation of principal operator; summer of 1951, four States.

Table 13.—Distribution of passenger-car travel classified by place of travel and by occupation of principal operator; summer of 1951, four States [1]

Place of travel	Distribution of passenger-car travel by place of travel, according to occupation of principal operator											
	All occupations	Professionals and semiprofessionals	Proprietors, managers, and officials	Farmers and farm managers	Store and office clerks, salesmen	Traveling salesmen, agents, etc.	Craftsmen, foremen, skilled laborers, etc.	Operatives, semiskilled and unskilled workers, and laborers	Protective services	Personal-service workers	Housewives	Miscellaneous [2]
All travel:												
In unincorporated areas:	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Primary highways	54.2	61.0	55.9	49.9	52.0	56.8	54.5	53.1	51.6	53.1	56.8	55.1
Other rural roads	17.1	10.1	9.8	36.8	12.0	10.3	13.0	18.9	9.9	15.3	14.0	14.2
Subtotal	71.3	71.1	65.7	86.7	64.0	67.1	67.5	72.0	61.5	68.4	70.8	69.3
In incorporated places	28.7	28.9	34.3	13.3	36.0	32.9	32.5	28.0	38.5	31.6	29.2	30.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
In State of residence:												
In unincorporated areas:												
Primary highways	48.1	52.2	46.2	48.2	42.8	53.0	49.0	46.0	47.9	48.8	52.0	53.3
Other rural roads	16.9	9.3	9.7	36.5	11.9	10.3	12.9	18.8	9.9	15.0	13.6	13.8
Subtotal	65.0	61.5	55.9	84.7	54.7	63.3	61.9	64.8	57.8	63.8	65.6	67.1
In incorporated places	27.3	27.6	32.9	12.8	33.8	31.6	31.4	26.2	36.5	28.8	26.9	30.2
Total	92.3	89.1	88.8	97.5	88.5	94.9	93.3	91.0	94.3	92.6	92.5	97.3
Outside State of residence:												
In unincorporated areas:												
Primary highways	6.1	8.8	9.7	1.7	9.2	3.8	5.5	7.1	3.7	4.3	4.8	1.8
Other rural roads	.2	.8	.1	.3	.1		.1	.1		.3	.4	.4
Subtotal	6.3	9.6	9.8	2.0	9.3	3.8	5.6	7.2	3.7	4.6	5.2	2.2
In incorporated places	1.4	1.3	1.4	.5	2.2	1.3	1.1	1.8	2.0	2.8	2.3	.5
Total	7.7	10.9	11.2	2.5	11.5	5.1	6.7	9.0	5.7	7.4	7.5	2.7

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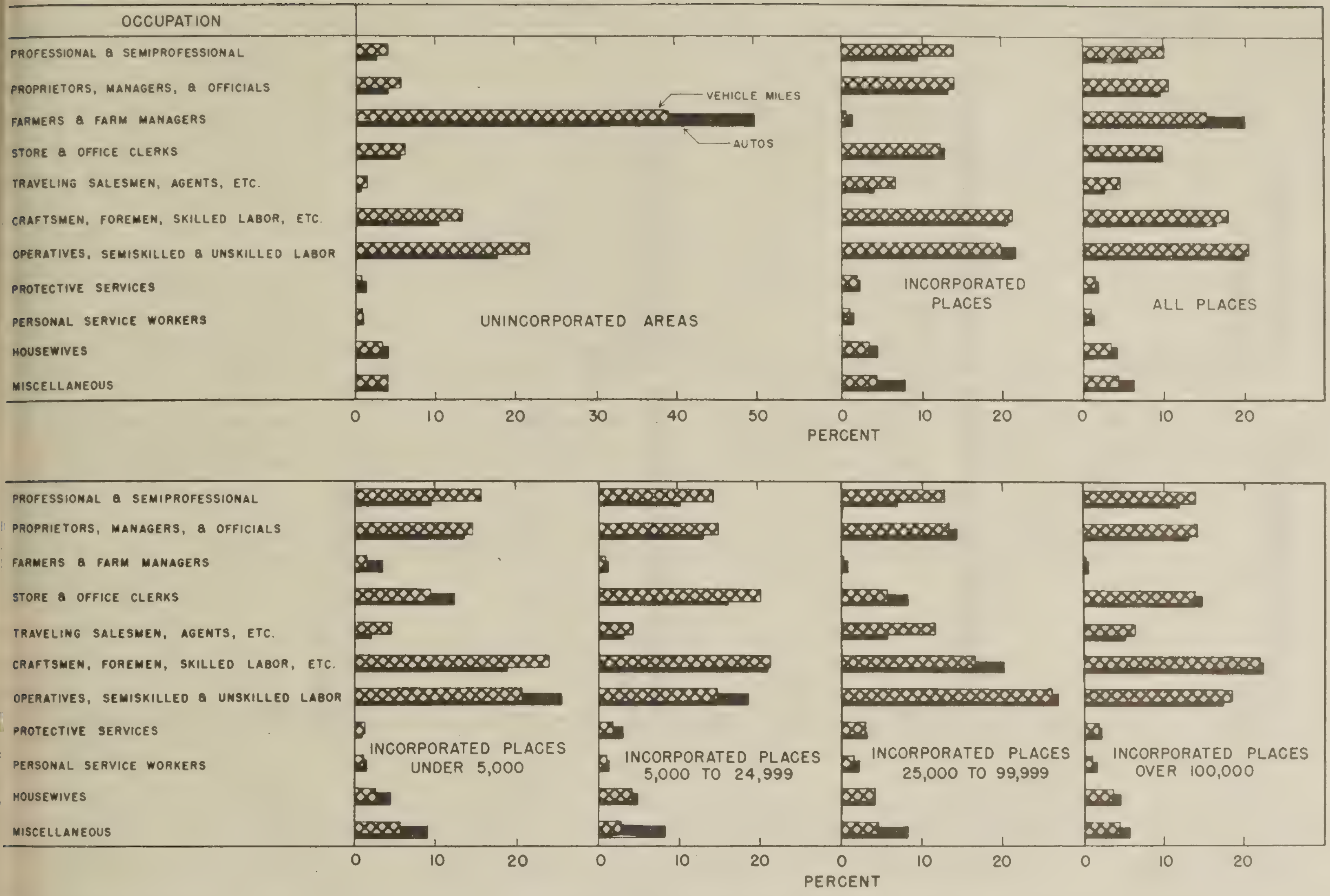
[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.
[2] Miscellaneous includes retired persons, occupations not otherwise classified, and occupations not reported.



igure 14.—Passenger cars in use and passenger-car travel, classified by occupation for each place of residence of principal operator; summer of 1951, four States.

Distribution by Purpose of Trip

The following discussion relates trip-length requency to purpose of travel. A more comlete discussion of purpose of travel as related o amount of travel by occupation and resience of the principal operator is given in the ection of the report following this discussion.

The trip-length frequency distribution for urposes other than vacation trips and to a esser extent trips for medical and dental urposes was very similar, with a high requency of short-length trips. This informaion may be seen in figure 17 and table 17.

Vacation trips are, of course, predominantly n the longest-length group of 100 miles or nore. This length group includes about 69 ercent of the vacation trips. In respect to acation trips, it is somewhat odd to note that ne-tenth of the trips for this purpose were ound to be under 5 miles in length. This is robably caused largely by the number of eople residing close to the place where they pend their vacation.

Trips for medical and dental purposes, while ollowing generally the trip-length distribution f purposes other than vacation trips, have proportionately greater percentages of trips in the several length groups above 5 miles, although 42 percent of these trips were in the under-5-mile group. This, of course, is a result of the increasing centralization of medical services in the larger places.

Shopping trips exhibited the greatest proportion of short-length trips (under 5 miles), 76 percent, as compared with 74 percent for educational, civic, and religious trips, 68 percent for work trips, and about 50 percent for each of the remaining purposes other than vacation trips and medical and dental trips.

PURPOSE OF AUTOMOBILE TRAVEL

The purpose for which the travel was performed is considered an important characteristic of any travel-habit study. In this report, purpose of travel is limited to passenger-car travel since most of the truck travel is performed for business purposes. All travel in passenger cars was classified according to the purpose for which the vehicle trip was made. For example, if the vehicle was being used to carry a passenger to work, the trip was classified as a work trip rather than a trip to serve a passenger, as would be done in most urban origin-and-destination studies. In this study, serving a passenger is considered only an incidental purpose and not the reason for which the vehicle is used. Also, returning home is not considered as a separate trip purpose in these studies. The return-home portion of the trip is classified according to the purpose of the outbound portion of the trip or, in the case of a round-trip involving three or more principal segments, the return-home portion is classified according to the major purpose involved for all segments.

Distribution of Trips and Travel by Purpose

The distribution of the number of trips and the amount of travel according to trip purpose is shown in figure 18 and table 18. Roughly two-thirds of the total travel—73 percent of the trips and 60 percent of the vehicle-miles—was "necessity" travel, that is, travel made in connection with earning a living and for family business; and of the necessity travel itself about three-fourths of the vehicle-miles and two-thirds of the trips were made in connection with earning a living. One-half of the vehicle-miles of travel and two-thirds of the trips made in connection with earning a living resulted from travel to and from work.

About 5 percent of the trips and 3 percent of the travel was for educational, civic, and religious purposes. The remainder, about one-fourth of the trips and slightly over one-third of the travel, was made for social and recreational purposes.

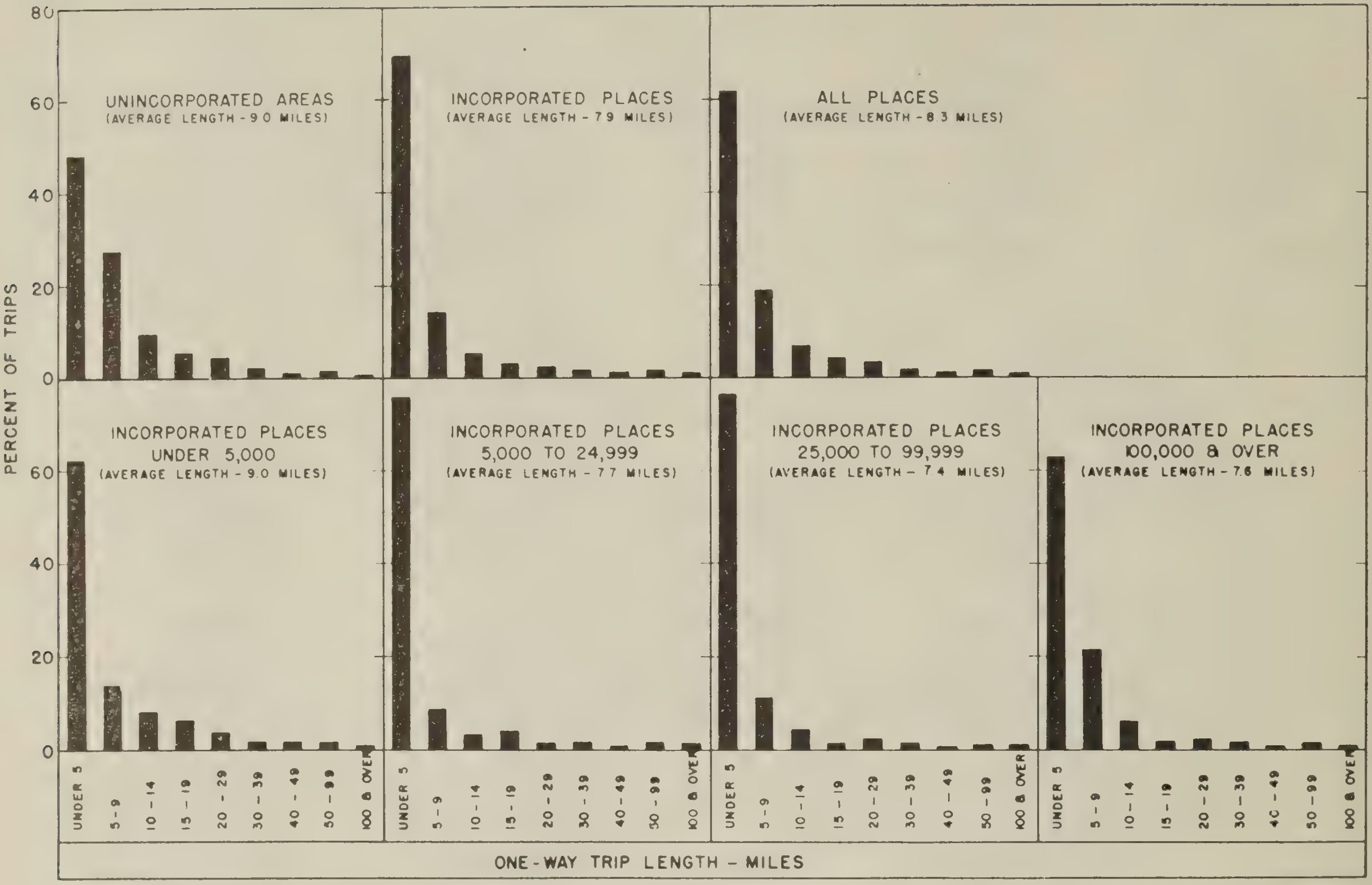


Figure 15.—Passenger-car trips classified by trip length and by residence of principal operator; summer of 1951, four States.

The average trip length for each purpose is shown at the top of the bars in figure 18. As noted previously, the shopping trip was the shortest trip and the vacation trip was by far the longest. The distributions of travel in each of the four States were very similar for all the principal purposes. The only differences of any magnitude occurred in the distribution between pleasure rides and "other" under the social and recreational purpose classification. Two of the States showed a low percentage of pleasure rides and a high percentage of "other" while the other two States showed the reverse. This was the result of differences in the interpretation placed by the States on the definition of a "pleasure ride".

Relation of Travel Purpose to Residence and Occupation of Operator

As shown in figure 19 and table 19, the distribution of passenger-car travel by trip purpose was generally similar for each population group of residence. For example, each group, with one exception, performed about 45 percent of their total automobile travel in connection with earning a living. The only deviation occurred in the places having a population of 25,000–99,999 in which 34 percent of the travel was for earning a living. This population group had a correspondingly high percentage of travel (50 percent) for social and recreational purposes.

Family business accounted for a greater proportion of the total travel by residents of

Table 14.—Distribution of passenger-car trips classified by one-way trip length and by residence of principal operator; summer of 1951, four States [1]

One-way trip length	Distribution of passenger-car trips by trip length, according to residence of principal operator						
	All places	Unincorporated areas	Incorporated places with population of—				
			Total	Under 5,000	5,000–24,999	25,000–99,999	100,000 and over
Miles	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Under 5	61.7	48.0	69.3	62.3	75.9	76.4	63.0
5–9	18.9	27.3	14.2	13.9	8.8	11.4	21.6
10–14	6.9	9.6	5.5	8.0	3.3	4.4	6.1
15–19	4.2	5.6	3.2	6.2	4.1	1.3	2.1
20–29	3.2	4.5	2.5	3.5	1.8	2.2	2.5
30–39	1.8	2.2	1.7	1.6	1.9	1.5	1.6
40–49	1.0	1.0	1.0	1.7	1.0	.6	.7
50–99	1.5	1.3	1.6	1.7	1.9	1.1	1.6
100 and over	.8	.5	1.0	1.1	1.3	1.1	.8
All trips	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average length, miles	*8.3*	*9.0*	*7.9*	*9.0*	*7.7*	*7.4*	*7.6*

Arkansas, Louisiana, Oklahoma, and Wisconsin.

Table 15.—Distribution of passenger-car travel classified by one-way trip length and by residence of principal operator; summer of 1951, two States [1]

One-way trip length	Distribution of passenger-car travel by trip length, according to residence of principal operator						
	All places	Unincorporated areas	Incorporated places with population of—				
			Total	Under 5,000	5,000–24,999	25,000–99,999	100,000 and over
Miles	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Under 5	13.4	9.6	15.8	8.3	14.2	20.8	21.7
5–9	14.2	15.7	13.3	9.7	8.2	10.0	20.5
10–14	7.9	9.4	7.0	6.7	5.4	5.5	8.8
15–19	9.5	11.1	8.5	11.3	15.5	2.7	3.0
20–29	10.0	13.9	7.5	9.1	6.6	7.5	6.9
30–39	7.6	9.8	6.1	7.2	5.6	10.9	4.3
40–49	4.3	5.1	3.7	3.1	6.1	5.6	1.9
50–99	13.9	11.3	15.6	14.9	15.5	18.5	15.3
100 and over	19.2	14.1	22.5	29.7	22.9	18.5	17.6
All travel	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Louisiana and Oklahoma.

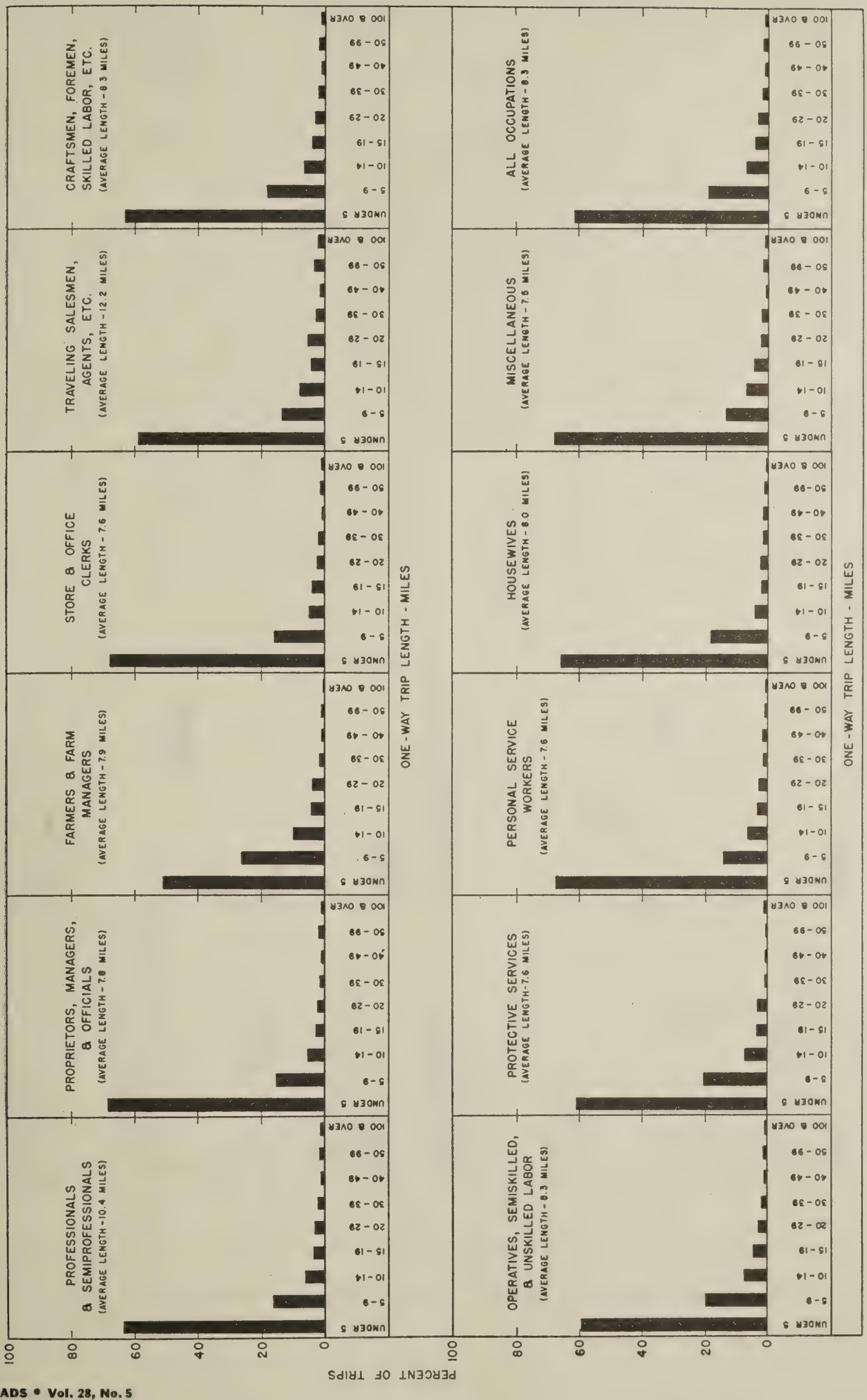


Figure 16.—Passenger-car trips classified by trip length and by occupation of principal operator; summer of 1951, four States.

Table 16.—Distribution of passenger-car trips classified by one-way trip length and by occupation of principal operator; summer of 1951, four States [1]

Characteristic	Distribution of passenger-car trips by trip length and occupation of principal operator										
	All occupations	Professionals and semiprofessionals	Proprietors, managers, and officials	Farmers and farm managers	Store and office clerks, salesmen	Traveling salesmen, agents, etc.	Craftsmen, foremen, skilled laborers, etc.	Operatives, semiskilled and unskilled workers, and laborers	Protective services	Personal service workers	Housewives	Miscellaneous [2]
DISTRIBUTION BY ONE-WAY TRIP LENGTH											
Miles	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Under 5	61.7	63.3	68.5	51.0	67.5	58.8	62.8	59.5	61.0	67.6	66.0	67.9
5–9	18.9	16.4	15.3	26.6	16.0	13.6	18.2	20.1	20.4	14.2	18.6	13.5
10–14	6.9	6.3	5.3	10.0	5.0	7.9	6.5	7.4	7.4	6.8	4.4	7.2
15–19	4.2	3.8	2.9	4.5	4.0	4.5	4.1	5.1	4.0	3.4	2.4	4.6
20–29	3.2	3.2	2.6	4.0	2.6	5.3	3.2	3.2	3.4	3.1	2.7	2.3
30–39	1.8	2.2	1.3	1.9	1.8	3.0	1.9	1.8	.8	1.4	1.7	2.1
40–49	1.0	1.3	1.0	.8	.9	1.4	.8	1.0	.8	1.8	1.9	.3
50–99	1.5	1.9	2.0	1.0	1.3	3.3	1.6	1.3	.6	.9	1.3	1.2
100 and over	.8	1.6	1.1	.2	.9	2.2	.9	.6	1.6	.8	1.0	.9
All trips	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average length, miles	*8.3*	*10.4*	*7.8*	*7.9*	*7.6*	*12.2*	*8.3*	*8.3*	*7.6*	*7.6*	*8.0*	*7.5*
DISTRIBUTION OF TRIPS BY OCCUPATION											
Arkansas	100.0	11.2	15.4	11.2	11.5	1.9	17.2	19.0	1.9	1.0	4.0	5.7
Louisiana	100.0	10.4	12.8	8.2	12.5	2.7	20.0	19.8	2.1	1.7	4.8	5.0
Oklahoma	100.0	7.7	9.7	12.1	17.3	4.5	15.9	19.3	2.7	1.1	3.5	6.2
Wisconsin	100.0	6.7	11.0	22.4	7.3	3.0	18.6	21.8	.9	1.1	3.3	3.9
Four States combined	100.0	8.1	11.6	16.3	10.9	3.1	18.1	20.6	1.6	1.2	3.7	4.8

[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.
[2] Includes retired persons, occupations not otherwise classified, and occupations not reported.

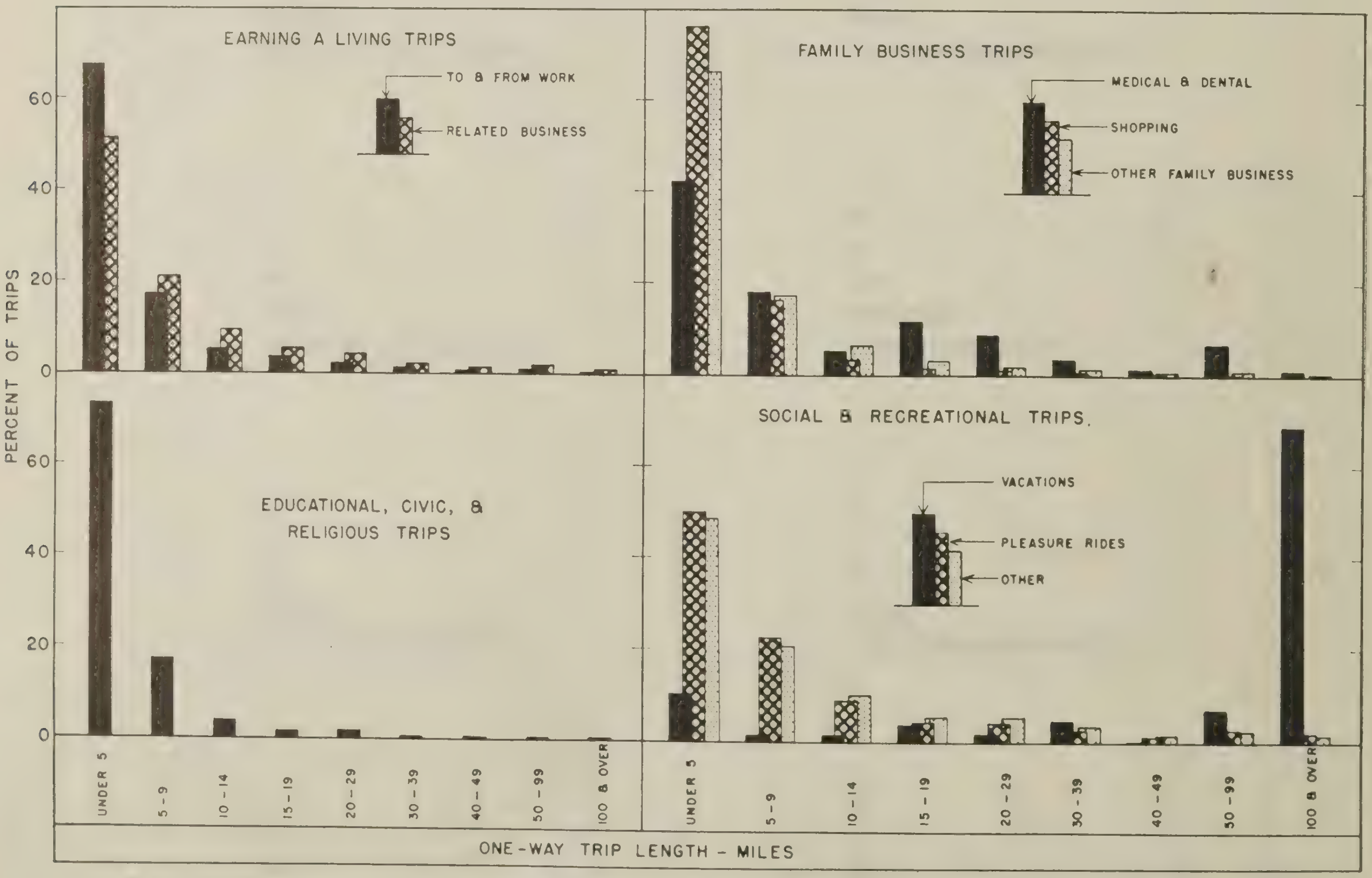


Figure 17.—Passenger-car trips classified by trip length and by major purpose of trip; summer of 1951, four States.

Table 17.—Distribution of passenger-car trips classified by trip length and by purpose of trip; summer of 1951, four States [1]

One-way trip length	Distribution of passenger-car trips by trip length and purpose									
	All purposes	Earning a living		Family business			Educational, civic, religious	Social and recreational		
		To and from work	Related business	Medical and dental	Shopping	Other		Vacations	Pleasure rides	Other
	PURPOSE BY TRIP LENGTH									
Miles	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Under 5	61.7	67.6	51.6	42.3	76.1	66.5	73.5	10.7	50.3	48.7
5-9	18.9	17.4	21.2	18.1	16.7	17.4	17.4	1.3	22.8	20.8
10-14	6.9	5.5	9.7	5.3	3.3	6.7	4.0	1.5	9.1	10.5
15-19	4.2	3.8	5.6	12.0	1.9	3.3	1.8	3.8	4.6	5.7
20-29	3.2	2.4	4.6	9.0	1.1	2.1	2.0	1.9	4.4	5.3
30-39	1.8	1.3	2.5	3.9	.6	1.7	.3	4.8	2.7	3.4
40-49	1.0	.8	1.6	1.3	.2	.8	.3	---------	1.2	1.6
50-99	1.5	.9	2.1	7.0	.1	1.0	.4	7.1	2.8	2.7
100 and over	.8	.3	1.1	1.1	---------	.5	.3	68.9	2.1	1.3
All trips	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	TRIP LENGTH BY PURPOSE									
Under 5	100.0	35.4	14.2	.9	16.5	9.4	5.5	---------	7.4	10.7
5-9	100.0	29.7	19.1	1.3	11.8	8.1	4.3	---------	10.9	14.8
10-14	100.0	25.5	23.7	1.0	6.4	8.5	2.7	---------	11.8	20.4
15-19	100.0	30.0	22.7	3.9	6.3	7.0	2.0	.2	10.0	17.9
20-29	100.0	24.1	24.1	3.7	4.5	5.6	2.9	.1	12.4	22.6
30-39	100.0	23.2	22.6	2.8	4.1	7.9	.7	.5	13.4	24.8
40-49	100.0	26.8	28.5	1.8	2.1	7.0	1.2	---------	10.8	21.8
50-99	100.0	18.7	24.2	6.3	1.3	5.7	1.4	.9	17.0	24.5
100 and over	100.0	9.3	23.0	1.8	.7	5.6	2.0	14.5	23.1	20.0
All trips	100.0	32.2	17.0	1.3	13.4	8.7	4.6	.2	9.0	13.6

[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.

Table 18.—Distribution of passenger-car trips and travel classified by purpose of trip; summer of 1951, four States [1]

Purpose of trip	Distribution of—		Average trip length
	Trips	Vehicle miles	
Earning a living:	*Pct.*	*Pct.*	*Miles*
To and from work	32.2	22.7	5.9
Related business	17.0	21.3	10.4
Subtotal	49.2	44.0	7.4
Family business:			
Medical and dental	1.3	2.5	15.5
Shopping	13.4	6.0	3.7
Other	8.7	7.3	6.9
Subtotal	23.4	15.8	5.6
Education, civic, and religious	4.6	2.8	5.0
Social and recreational:			
Vacations	.2	4.8	249.7
Pleasure rides	9.0	14.1	13.0
Other	13.6	18.5	11.4
Subtotal	22.8	37.4	13.7
All purposes	100.0	100.0	8.3

[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.

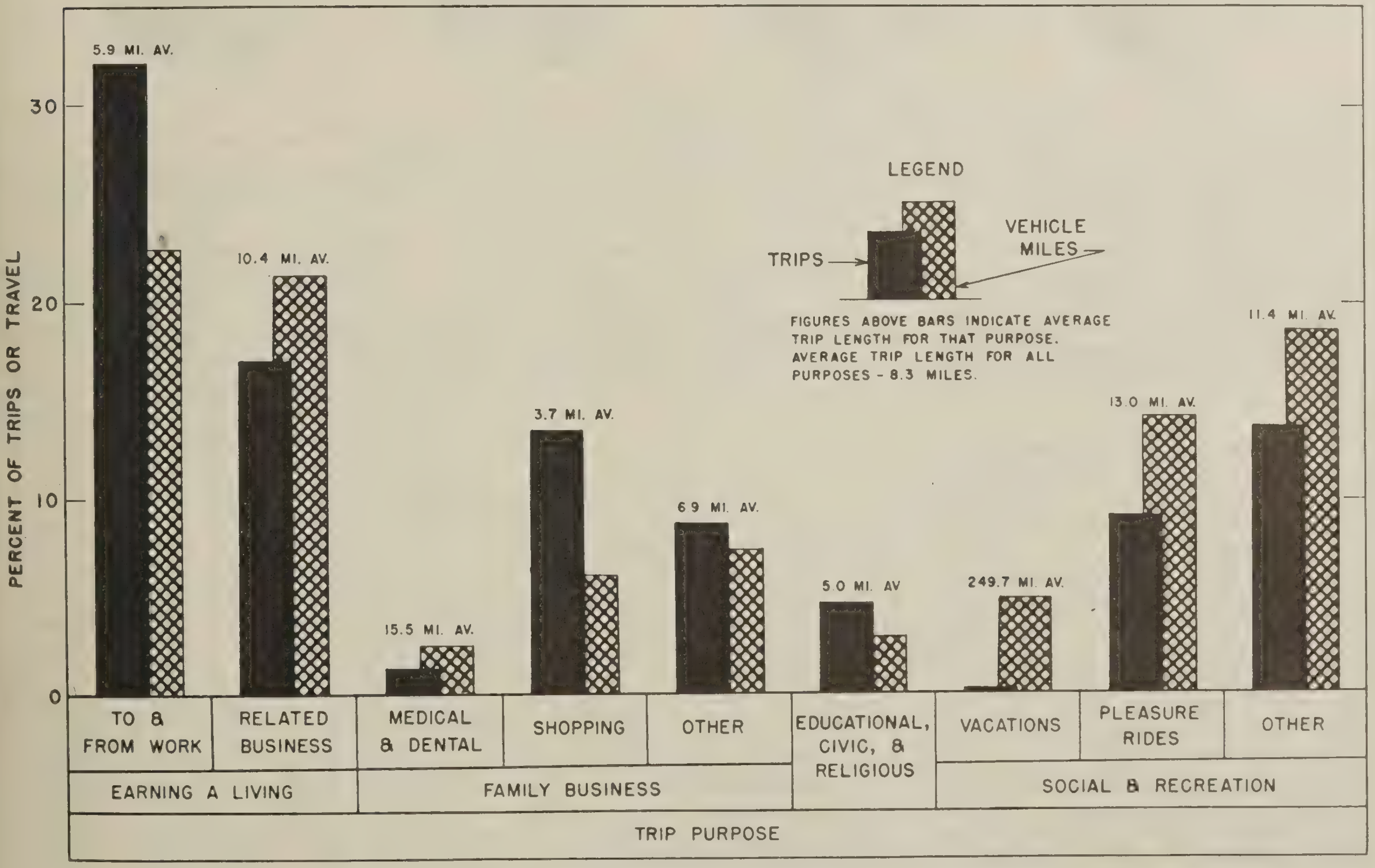


Figure 18.—Passenger-car trips and travel classified by major purpose of trip; summer of 1951, four States.

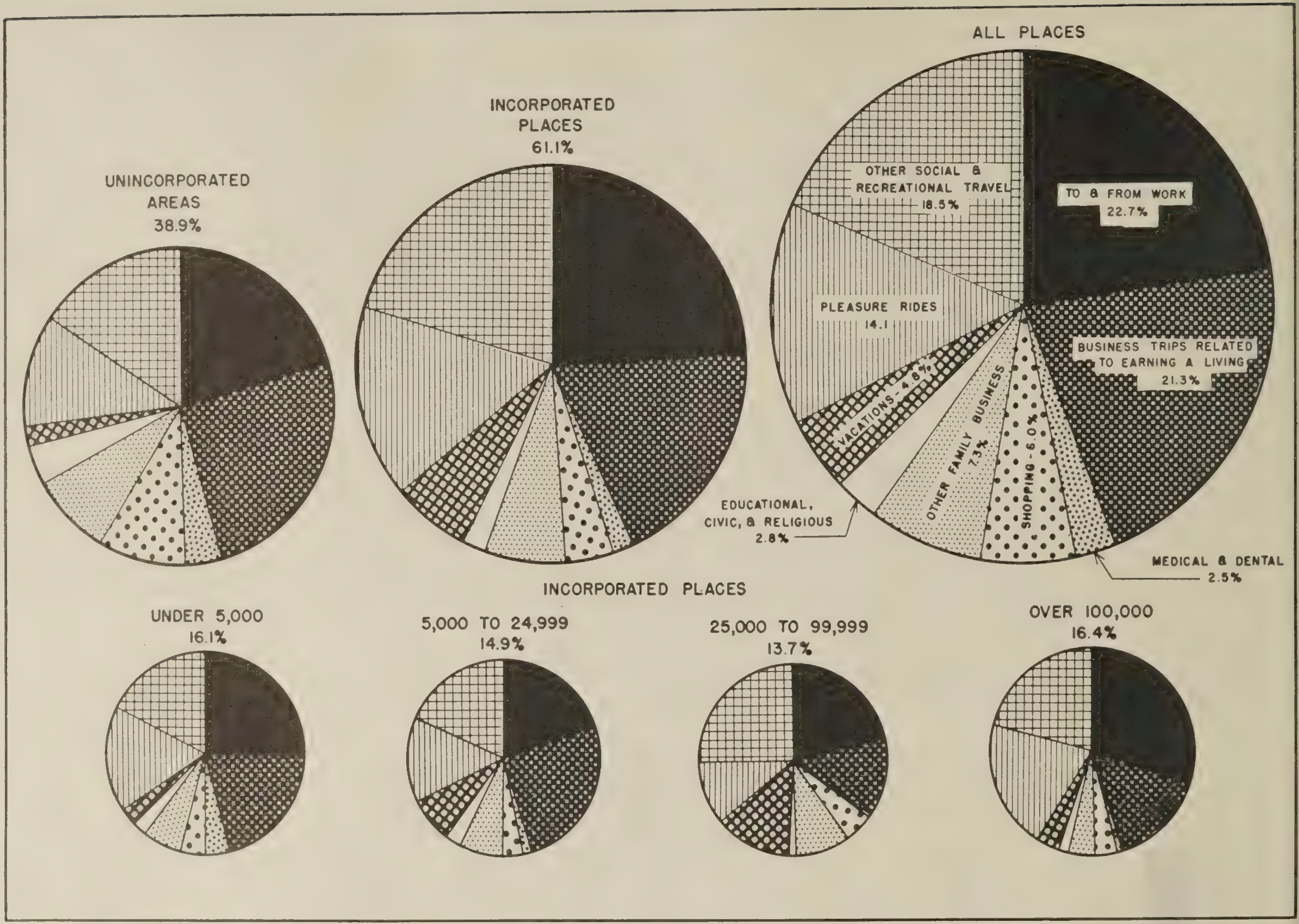


Figure 19.—Passenger-car travel classified by major purpose of travel and by residence of principal operator; summer of 1951, four States.

unincorporated areas (21 percent) than it did for residents of incorporated places (12 percent). On the other hand, a higher proportion of travel for social and recreational purposes was found for the residents of incorporated places (43 percent) than of unincorporated areas (29 percent).

The distribution of passenger-car travel by purpose of travel, classified by the occupation of the principal operator, as shown in figure 20 and table 20, was fairly similar for nearly all occupations.

Necessity travel ranged from 47 to 72 percent for gainfully employed workers in the occupational groups, averaging 60 percent.

Farmers did little home-to-work travel but had more than average related business travel, so they had nearly the same amount of total travel for earning a living as was found for other occupations.

Cars of which traveling salesmen and agents were the principal operators traveled 67 percent of their total mileage for the purpose of earning a living, whereas cars operated by persons in other occupations, excluding housewives and personal-service workers, traveled from 41 to 59 percent in this category.

Cars of which the housewives were the principal operators had only one-fifth of their mileage as earning-a-living travel; nearly one-half of their travel was for social and recreational purposes.

Table 19.—Distribution of passenger-car travel classified by purpose of travel and by residence of principal operator; summer of 1951, four States[1]

Purpose of travel	Distribution of passenger-car travel by purpose, according to residence of principal operator						
	All population groups	Unincorporated areas	Incorporated places with population of—				
			All places	Under 5,000	5,000–24,999	25,000–99,999	100,000 and over
Earning a living:	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
To and from work	22.7	20.6	24.1	25.0	19.6	21.0	29.8
Related business	21.3	24.9	19.0	21.2	25.7	13.3	15.4
Subtotal	44.0	45.5	43.1	46.2	45.3	34.3	45.2
Family business:							
Medical and dental	2.5	3.8	1.7	3.9	1.4	.5	.8
Shopping	6.0	9.1	4.0	4.0	3.3	5.2	3.6
Other	7.3	8.4	6.5	6.3	7.2	9.2	4.0
Subtotal	15.8	21.3	12.2	14.2	11.9	14.9	8.4
Educational, civic, religious	2.8	4.0	2.0	2.2	2.6	1.2	1.8
Social and recreational:							
Vacation	4.8	2.1	6.5	2.8	7.4	13.3	3.6
Pleasure rides	14.1	11.5	15.8	17.0	14.2	10.9	20.1
Other	18.5	15.6	20.4	17.6	18.6	25.4	20.9
Subtotal	37.4	29.2	42.7	37.4	40.2	49.6	44.6
All purposes	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.

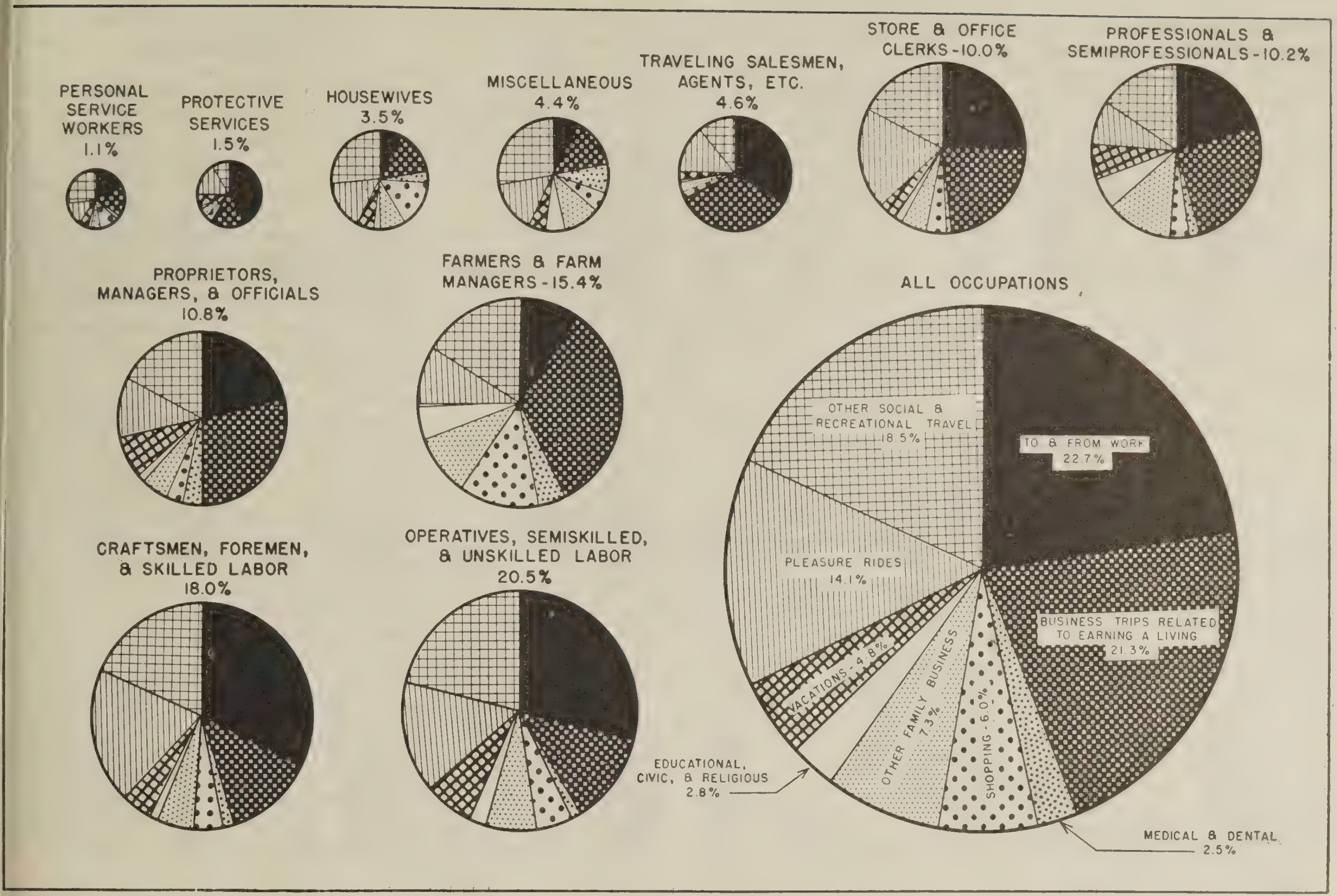


Figure 20.—Passenger-car travel classified by major purpose of travel and by occupation of principal operator; summer of 1951, four States.

COMPARISON WITH EARLIER STUDIES

The road-use and motor-vehicle-allocation studies made by the State highway departments between 1935 and 1940 and the motor-vehicle-use studies made since 1950 were all initiated for the purpose of learning more about the characteristics of motor-vehicle ownership and use than was available from other sources. The motor-vehicle-allocation studies were undertaken primarily to obtain information about the characteristics of motor-vehicle ownership, while the road-use studies were designed to obtain information about the characteristics of motor-vehicle use. The present studies are intended to obtain information comparable to that secured in both of the earlier types of studies, and additional information not obtained in either of the previous studies.

There are some important differences in the procedures employed in the three types of studies. All are sample studies in which the aim is to obtain an indication of the character-

Table 20.—Distribution of passenger-car travel classified by purpose of travel and by occupation of principal operator; summer of 1951, four States[1]

Occupation of principal operator	Distribution of passenger-car travel by purpose of travel												
	Total	Earning a living			Family business				Educational, civic, religious	Social and recreational			
		Total	To and from work	Related business	Total	Medical and dental	Shopping	Other		Total	Vacation	Pleasure rides	Other
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Professionals and semiprofessionals	100.0	45.3	20.1	25.2	18.0	1.8	3.7	12.5	5.8	30.9	6.9	8.4	15.6
Proprietors, managers, and officials	100.0	50.0	21.1	28.9	12.3	3.7	3.3	5.3	1.3	36.4	7.9	11.0	17.5
Farmers and farm managers	100.0	42.4	9.4	33.0	26.9	4.6	12.8	9.5	5.2	25.5	.3	8.9	16.3
Store and office clerks, salesmen	100.0	48.3	24.4	23.9	9.7	.9	3.9	4.9	1.6	40.4	3.3	19.3	17.8
Traveling salesmen, agents, etc	100.0	67.3	33.4	33.9	5.3	.1	2.2	3.0	.7	26.7	2.3	13.8	10.6
Craftsmen, foremen, skilled laborers, etc	100.0	45.0	31.9	13.1	11.4	1.9	4.1	5.4	1.3	42.3	4.5	19.3	18.5
Operatives, semiskilled and unskilled workers, and laborers	100.0	41.1	28.4	12.7	13.5	1.3	5.2	7.0	2.4	43.0	6.9	14.8	21.3
Protective services	100.0	58.9	41.5	17.4	8.9	.2	3.8	4.9	.6	31.6	6.5	16.1	9.0
Personal-service workers	100.0	34.1	17.4	16.7	18.2	1.4	11.2	5.6	1.4	46.3	5.5	13.6	27.2
Housewives	100.0	22.1	7.6	14.5	27.9	3.3	15.9	8.7	1.8	48.2	5.5	16.1	26.6
Miscellaneous[2]	100.0	22.0	7.5	14.5	24.5	8.1	5.3	11.1	5.4	48.1	4.8	15.3	28.0
All occupations	100.0	44.0	22.7	21.3	15.8	2.5	6.0	7.3	2.8	37.4	4.8	14.1	18.5

[1] Arkansas, Louisiana, Oklahoma, and Wisconsin.
[2] Includes retired persons, occupations not otherwise classified, and occupations not reported.

istics of a "universe" by collecting information from a representative sample of cases selected from the universe. In most instances the universe selected for the earlier studies was the motor-vehicle registrations of the last previous complete year. The basic universe selected for the newer motor-vehicle-use studies was the total number of dwelling units in the State being studied, although in some instances (not among the States reported on in this article, however) the commercial-vehicle registrations have been used as a supplemental universe to obtain information on the characteristics of ownership and operation of certain classes of freight-carrying vehicles.

Methods of Sampling

The information sought in the road-use and motor-vehicle-use studies was obtained through personal interviews with the respondents. On the other hand, the information desired for the motor-vehicle-allocation studies was obtained through replies submitted by respondents to mail questionnaires. For the road-use studies, the practice employed in most States was to obtain interviews from a sample of approximately 2 percent of the passenger-car owners and 5 percent of the truck owners. Data on commercial buses were generally obtained on a 100-percent sample basis, with various methods being employed in the different States to collect information about publicly operated buses, such as school buses.

One notable departure from the general methods described above was employed in those States in which the so-called "school method" of obtaining interviews was used. In these States, the study was set up as a school project in certain civics or government classes in selected high schools. Information about the ownership and operation of trucks and buses was usually obtained by regularly employed interviewers.

In contrast to the procedures employed in the motor-vehicle-use studies, where the interviewers are given no latitude in selecting persons to be interviewed, considerable latitude was given to the road-use survey interviewers in selecting their interview prospects. The method most commonly employed involved the assignment of area or place quotas to the interviewers who were instructed to make their contacts on a more or less random basis. Controls were imposed, however, to insure that the samples obtained would conform closely to known conditions in certain respects. These controls included the requirement that urban interviews be distributed among persons employed in various occupations approximately according to the percentage distribution of these workers in the various occupations. Another requirement was that the year-model distribution of vehicles included in the sample be approximately in agreement with the comparable distribution of vehicles registered. A third requirement imposed wherever possible was that interviews taken in unincorporated areas be distributed among residents on the various road systems in proportion to the distribution of dwelling units among the systems as found in the road inventory. In a few instances, interviewers were given lists of persons to be contacted, but since these lists were usually drawn from the registration lists of the previous year the percentage of contact failures was generally high and this method of interviewing proved unduly expensive.

In designing the basic sampling procedures for the motor-vehicle-use studies, advantage was taken of the more scientific sampling procedures that had become general practice during the intervening period. The procedures adopted were essentially those used for the home-interview origin-and-destination studies that had been made by the State highway departments during the last few years in many of the larger cities. The sampling procedures used are described early in this report.

Nature of Travel Information Obtained

Perhaps the most important difference between the road-use surveys and the motor-vehicle-use studies is found in the nature of the travel information obtained. In the earlier studies, an attempt was made to obtain data about the trips made to various points and for various purposes during an entire 12-month period, generally the 12-month period immediately preceding the date of the interview. The basic procedures designed for the present studies call for obtaining data only for trips completed on the most recent weekday and Saturday and Sunday. For the extended or complete motor-vehicle use study these procedures provide that one-fourth of the interviews should be obtained in each area sampled in each of the four seasons of the year. The effect of these changes in procedures should be to reduce memory bias or unreliability in the information obtained, and to provide uniform seasonal coverage of the areas sampled.

In spite of the shortcomings of the procedures employed in the road-use and motor-vehicle-allocation studies, the results obtained in most States were surprisingly satisfactory, insofar as could be learned from comparisons made with known data or estimates calculated independently by other means. Data developed from those studies have been used extensively in many different ways.

Reconciliation of System Classifications

It is not possible to provide direct comparisons of the information obtained in the road-use and motor-vehicle-use studies for various reasons, one of the most important being the differences in highway system classification employed for the two studies. Table 21 compares the mileages of the various system classifications of highways adopted for the two studies in each of the four States. The system classifications adopted for the earlier studies were not necessarily the official or legal ones at the time the studies were made, but were use classifications made especially for the financial and road-use studies of the highway planning surveys. The system mileages were obtained from tabulations prepared for the financial studies.

For this comparison an attempt was made to bring the system classifications used in the earlier studies in line with those used in the motor-vehicle-use studies. In the case of Wisconsin, which has separate official county and town road systems, treated separately in the road-use studies, all such roads were grouped into one system, and the data for them combined for purposes of comparison with the motor-vehicle-use studies. In the case of Louisiana, the so-called primary system as designated for the road-use study included most of the mileage treated separately as "other State highways" in the motor-vehicle-use study, and some mileage which has since been transferred to parish (county) jurisdiction.

Comparison of Travel Distribution

Figure 21 presents what may perhaps be the most significant comparisons that can be made between the findings of the road-use and motor-vehicle-use studies. In preparing this presentation, certain combinations of data were made to place the information from both studies on a comparable basis. It will be seen that the rural-urban travel distribution for residents of unincorporated areas was very similar in 1951 to that found in the earlier studies. For residents of all places combined, the travel distribution in 1951 was found to be generally similar to that of the earlier studies, except that the 1951 studies

Table 21.—Comparison of highway system mileages in 1936–37 and 1951; four States

Road system	System mileage							
	Arkansas		Louisiana		Oklahoma		Wisconsin	
	1936	1951	1937	1951	1937	1951	1936	1951
Roads in unincorporated areas:								
State primary system	8, 597	9, 204	16, 771	2, 207	7, 945	9, 647	9, 206	9, 983
State secondary system	-----	-----	-----	11, 794	-----	-----	-----	-----
Local rural roads	45, 734	55, 417	22, 091	25, 778	93, 244	82, 272	72, 239	75, 894
Subtotal	54, 331	64, 621	38, 862	39, 779	101, 189	91, 919	81, 445	85, 877
Streets in incorporated places:								
Extensions of State roads	530	512	747	911	492	527	771	1, 236
Other streets	4, 079	4, 034	2, 941	4, 790	6, 240	6, 287	7, 113	7, 674
Subtotal	4. 609	4, 546	3, 688	5, 701	6, 732	6, 814	7, 884	8, 910
All roads and streets	58, 940	69, 167	42, 550	45, 480	107, 921	98, 733	89, 329	94, 787

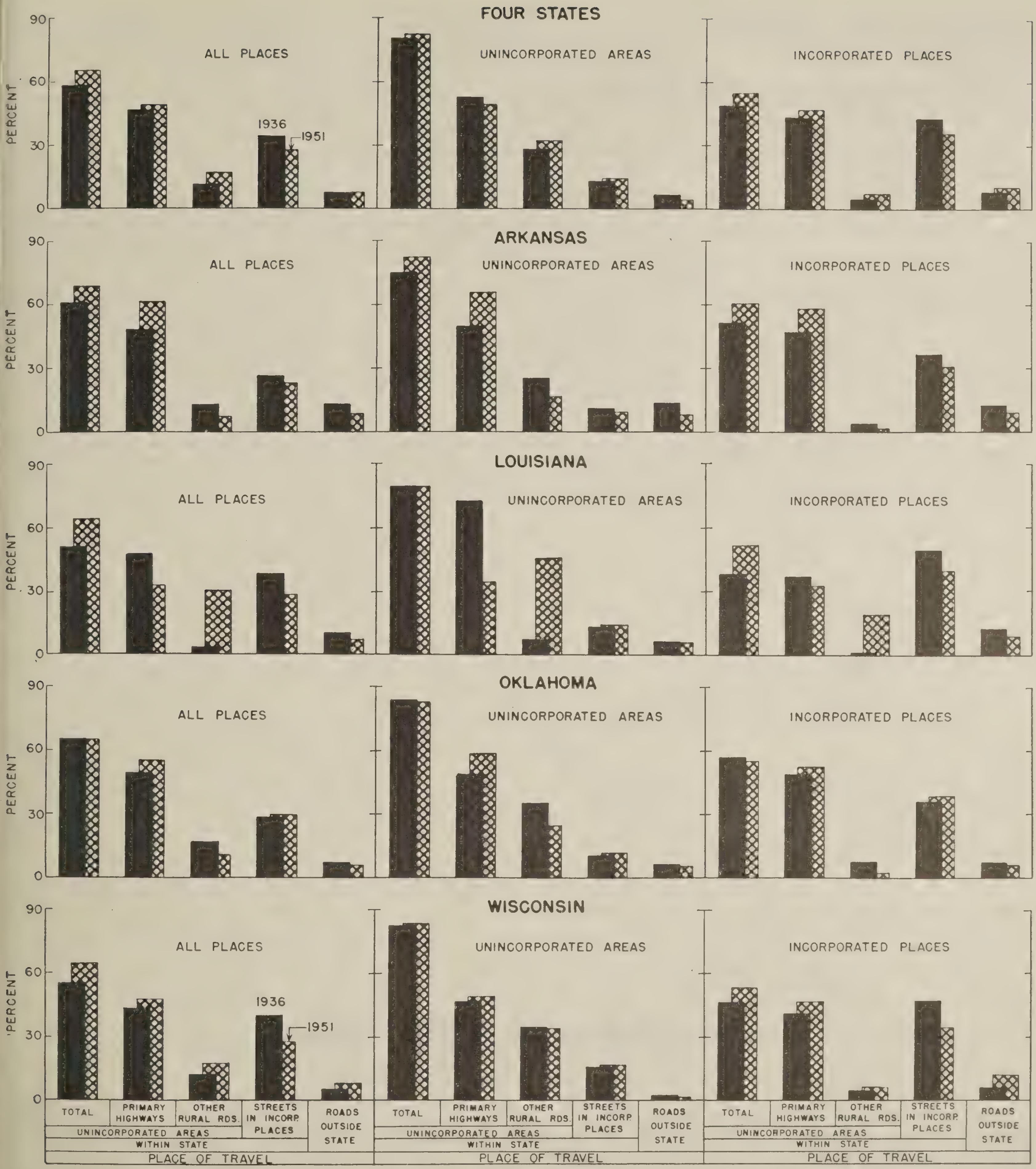


Figure 21.—Comparison of distribution of passenger-car travel by residents of all places, unincorporated areas, and incorporated places, as shown by the 1951 motor-vehicle-use studies and the 1936 road-use studies; four States.

indicated a somewhat smaller proportion of total travel was performed on the streets in incorporated places.

The only important difference noted in rural travel distribution was in the case of Louisiana, but the increase in percentage of total miles driven on "other rural roads" in 1951 as compared with the earlier studies can probably be traced largely to a transfer of a sizeable block of road mileage from the State primary to the State secondary system and a transfer of some roads to parish (county) jurisdiction.

Another factor affecting the comparisons between the two studies is the change in the rural-urban composition of the population. Oklahoma in 1940 was 38 percent urban and in 1950 was 50 percent urban. Arkansas and Louisiana each reported an increase of about 10 percent in urban population. Wisconsin reported about the same relation between urban and rural population as was found in 1940.[6]

It will be noted that in three of the four States the percentage of travel performed on streets of incorporated places was shown to be less in 1951 than in the earlier studies. This change cannot be explained completely, but there are certain factors which appear to make it seem reasonable. One is that the earlier studies were made during depression years when most people had less money to spend on taking long trips; therefore, a larger percentage of the trips occurred in the cities. In 1951, because of increase in vehicles in use, the travel by all residents of these States was considerably greater, in some instances almost twice as great, than it was at the time of the road-use study. Therefore, the total miles traveled on city streets was more in every case in 1951 than it was in the earlier studies. However, the greater proportionate increase in the miles traveled on rural roads was such as to have the effect of reducing the percentage of total travel on streets of incorporated places.

For all population groups combined in the four States, the percentage of the mileage being driven outside the State of residence was the same for the two studies. The unincorporated areas reported a smaller percentage of out-of-State travel and the incorporated places a larger percentage than was shown in the earlier studies. Among the individual States all but Wisconsin showed a smaller percentage of out-of-State travel in 1951 than was shown in 1936.

A limited comparison of the distribution of travel by purposes can be made between the two studies in the four States. The basic distribution of travel in the road-use studies was between business and pleasure purposes. The former included travel to and from work, related business travel, and travel on family business such as shopping and going to the dentist. The pleasure travel, which in some instances was subdivided between social and recreational purposes, included vacation travel, pleasure rides, and the travel designated as educational, civic, and religious in the 1951 studies. On the basis of this classification, 63 percent of the travel reported in the early studies in the four States was for business purposes, as compared with 60 percent in 1951.

Although it would have been very desirable, it was not possible to make comparisons between the earlier and later studies, of travel classified by trip lengths. The earlier data were analyzed on a basis which involved classification of trips according to trip lengths only for trips extending beyond city limits. Because of the relatively high percentages of trips made which do not go beyond city limits, especially by residents of urban places, and which are not separable from other trips in the tabulations of trip length data required for the motor-vehicle-use studies, it was not possible to make a meaningful comparison between the findings of the two studies in this respect.

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[6] *Census of Population: 1950, Volume I, Number of Inhabitants* (table 1 for each State). Bureau of the Census.

Braking Performance of Motor Vehicles

A New Publication of the Bureau of Public Roads

The Bureau of Public Roads recently published a 170-page bulletin, *Braking Performance of Motor Vehicles*, reporting a study of the braking performance of motor vehicles in everyday traffic, of new vehicles in optimum condition, and of used vehicles before and after brake-system maintenance and improvement. The bulletin describes the effect on brake performance of such factors as speed, weight, vehicle type and capacity, and brake type, and reports on the capabilities of brake testing devices. In all, 319 passenger cars, 8 buses, and 1,071 trucks and truck combinations were tested.

The bulletin discusses the general structure and provides the essential characteristics of practical brake regulations, and furnishes the basic data and interpretations thereof required by appropriate authorities in making intelligent selection of values of performance to be used in the body of any brake regulation.

An advisory committee representing industry and government aided the Bureau in the formulation of the program and procedures of the study, and reviewed and approved the analyses and report. More than 50 individual trucking operators cooperated by furnishing vehicles, drivers, and other facilities.

Braking Performance of Motor Vehicles may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 55 cents a copy.

U. S. GOVERNMENT PRINTING OFFICE: 1954

A list of the more important articles in PUBLIC ROADS may be obtained upon request addressed o Bureau of Public Roads, Washington 25, D. C.

PUBLICATIONS of the Bureau of Public Roads

The following publications are sold by the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Orders should be sent direct to the Superintendent of Documents. Prepayment is required.

ANNUAL REPORTS

Work of the Public Roads Administration:

1941, 15 cents. 1948, 20 cents.
1942, 10 cents. 1949, 25 cents.

Public Roads Administration Annual Reports:

1943; 1944; 1945; 1946; 1947.
(Free from Bureau of Public Roads)

Annual Reports of the Bureau of Public Roads:

1950, 25 cents. 1952, 25 cents.
1951, 35 cents. 1953, 25 cents.

PUBLICATIONS

Bibliography of Highway Planning Reports (1950). 30 cents.

Braking Performance of Motor Vehicles (1954). 55 cents.

Construction of Private Driveways, No. 272MP (1937). 15 cents.

Design Capacity Charts for Signalized Street and Highway Intersections (reprint from Public Roads, Feb. 1951). 25 cents.

Electrical Equipment on Movable Bridges, No. 265T (1931). 40 cents.

Factual Discussion of Motortruck Operation, Regulation, and Taxation (1951). 30 cents.

Federal Legislation and Regulations Relating to Highway Construction (1948). Out of print.

Financing of Highways by Counties and Local Rural Governments, 1931–41. 45 cents.

Highway Bond Calculations (1936). 10 cents.

Highway Bridge Location, No. 1486D (1927). 15 cents.

Highway Capacity Manual (1950). 75 cents.

Highway Needs of the National Defense, House Document No. 249 (1949). 50 cents.

Highway Practice in the United States of America (1949). 75 cents.

Highway Statistics (annual):

1945, 35 cents. 1948, 65 cents. 1951, 60 cents.
1946, 50 cents. 1949, 55 cents. 1952, 75 cents.
1947, 45 cents. 1950 (out of print).

Highway Statistics, Summary to 1945. 40 cents.

Highways in the United States, *nontechnical* (1954). 20 cents.

Highways of History (1939). 25 cents.

Identification of Rock Types (1950). Out of print.

Interregional Highways, House Document No. 379 (1944). 75 cents.

Legal Aspects of Controlling Highway Access (1945). 15 cents.

Local Rural Road Problem (1950). 20 cents.

Manual on Uniform Traffic Control Devices for Streets and Highways (1948). 75 cents.

Mathematical Theory of Vibration in Suspension Bridges (1950). $1.25.

Motor-Vehicle Traffic Conditions in the United States, House Document No. 462 (1938):

- Part 1.—Nonuniformity of State Motor-Vehicle Traffic Laws. 15 cents.
- Part 2.—Skilled Investigation at the Scene of the Accident Needed to Develop Causes. 10 cents.
- Part 3.—Inadequacy of State Motor-Vehicle Accident Reporting. 10 cents.
- Part 4.—Official Inspection of Vehicles. 10 cents.
- Part 5.—Case Histories of Fatal Highway Accidents. 10 cents.
- Part 6.—The Accident-Prone Driver. 10 cents.

PUBLICATIONS (Cont'd)

Principles of Highway Construction as Applied to Airports, Flight Strips, and Other Landing Areas for Aircraft (1943). $2.00.

Public Control of Highway Access and Roadside Development (1947). 35 cents.

Public Land Acquisition for Highway Purposes (1943). 10 cents.

Results of Physical Tests of Road-Building Aggregate (1953). $1.00.

Roadside Improvement, No. 191MP (1934). 10 cents.

Selected Bibliography on Highway Finance (1951). 60 cents.

Specifications for Construction of Roads and Bridges in National Forests and National Parks, FP–41 (1948). $1.50.

Standard Plans for Highway Bridge Superstructures (1953). $1.25.

Taxation of Motor Vehicles in 1932. 35 cents.

Tire Wear and Tire Failures on Various Road Surfaces (1943). 10 cents.

Transition Curves for Highways (1940). $1.75.

Uniform Vehicle Code:

- Act I.—Uniform Motor-Vehicle Administration, Registration, Certificate of Title, and Antitheft Act (1945). 15 cents.
- Act II.—Uniform Motor-Vehicle Operators' and Chauffeurs' License Act (revised 1952). 15 cents.
- Act III.—Uniform Motor-Vehicle Civil Liability Act (1944). 10 cents.
- Act IV.—Uniform Motor-Vehicle Safety Responsibility Act (revised 1952). 15 cents.
- Act V.—Uniform Act Regulating Traffic on Highways (revised 1952). 20 cents.
- Model Traffic Ordinance (revised 1953). 20 cents.

MAPS

State Transportation Map series (available for 39 States). Uniform sheets 26 by 36 inches, scale 1 inch equals 4 miles. Shows in colors Federal-aid and State highways with surface types, principal connecting roads, railroads, airports, waterways, National and State forests, parks, and other reservations. Prices and number of sheets for each State vary—see Superintendent of Documents price list 53.

United States System of Numbered Highways together with the Federal-Aid Highway System (also shows in color National forests, parks, and other reservations). 5 by 7 feet (in 2 sheets), scale 1 inch equals 37 miles. $1.25.

United States System of Numbered Highways. 28 by 42 inches, scale 1 inch equals 78 miles. 20 cents.

Single copies of the following publications are available to highway engineers and administrators for official use, and may be obtained by those so qualified upon request addressed to the Bureau of Public Roads. They are not sold by the Superintendent of Documents.

Bibliography on Automobile Parking in the United States (1946).

Bibliography on Highway Lighting (1946).

Bibliography on Highway Safety (1938).

Bibliography on Land Acquisition for Public Roads (1947).

Bibliography on Roadside Control (1949).

Express Highways in the United States: a Bibliography (1945).

Indexes to Public Roads, volumes 17–19 and 23.

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DEPARTMENT OF COMMERCE - BUREAU OF PUBLIC ROADS

STATUS OF FEDERAL-AID HIGHWAY PROGRAM

AS OF OCTOBER 31, 1954

FOR OFFICIAL USE

(Thousand Dollars)

STATE	UNPROGRAMMED BALANCES	ACTIVE PROGRAM											
		PROGRAMMED ONLY			PLANS APPROVED, CONSTRUCTION NOT STARTED			CONSTRUCTION UNDER WAY			TOTAL		
		Total Cost	Federal Funds	Miles	Total Cost	Federal Funds	Miles	Total Cost	Federal Funds	Miles	Total Cost	Federal Funds	Miles
Alabama	$18,445	$13,098	$7,342	289.7	$6,150	$2,969	150.8	$46,754	$23,449	535.1	$66,002	$33,760	975.6
Arizona	8,957	7,929	4,773	94.3	658	448	11.0	6,710	4,803	127.6	15,297	10,024	232.9
Arkansas	14,374	7,859	4,686	327.3	6,110	3,047	142.5	15,382	7,593	373.1	29,351	15,326	842.9
California	22,364	30,741	17,036	152.7	18,458	9,848	61.4	113,337	54,470	304.1	162,536	81,354	518.2
Colorado	15,683	9,327	5,303	179.2	1,877	1,045	44.6	17,769	9,734	167.9	28,973	16,082	391.7
Connecticut	18,796	1,476	738	4.9	822	410	1.0	6,635	3,173	8.1	8,933	4,321	14.0
Delaware	4,801	1,459	731	12.2	1,659	832	.5	7,888	4,291	37.1	11,006	5,854	49.8
Florida	14,408	21,801	11,218	232.9	9,298	4,803	145.3	17,654	9,311	283.1	48,753	25,332	661.3
Georgia	20,777	11,991	6,115	258.4	15,088	7,558	311.3	48,934	22,292	642.8	76,013	35,965	1,212.5
Idaho	8,418	4,162	2,660	70.7	3,322	2,116	66.0	14,272	8,909	210.8	21,756	13,685	347.5
Illinois	38,276	36,717	19,741	393.5	13,972	6,998	47.5	78,863	41,527	464.0	129,552	68,266	905.0
Indiana	28,022	33,365	16,691	140.3	14,700	8,442	49.1	29,282	15,023	135.6	77,347	40,156	325.0
Iowa	15,083	17,685	9,784	410.4	5,017	2,605	172.5	21,154	11,787	750.8	43,856	24,176	1,333.7
Kansas	18,249	9,218	4,634	680.4	6,422	3,251	309.7	18,897	9,692	822.6	34,537	17,577	1,812.7
Kentucky	15,552	10,991	5,943	76.6	7,351	3,675	127.3	26,509	13,322	238.2	44,851	22,940	442.1
Louisiana	17,599	11,968	5,972	107.2	5,727	2,863	25.2	35,287	16,434	153.7	52,982	25,269	286.1
Maine	6,849	7,662	4,039	41.9	2,190	1,197	20.9	14,110	7,014	120.0	23,962	12,250	182.8
Maryland	11,007	15,996	8,127	56.4	8,381	3,646	42.5	10,119	5,196	39.8	34,496	16,969	138.7
Massachusetts	18,532	5,494	2,737	18.9	7,356	3,651	4.5	51,809	24,317	43.8	64,659	30,705	67.2
Michigan	29,985	27,249	13,874	357.6	13,132	6,566	174.3	42,881	21,741	335.6	83,262	42,181	867.5
Minnesota	24,402	6,594	3,366	528.7	2,612	1,491	126.3	26,033	13,658	811.9	35,239	18,515	1,466.9
Mississippi	12,965	12,550	6,293	440.2	6,946	3,643	136.9	22,674	11,266	555.2	42,170	21,202	1,132.3
Missouri	22,496	21,643	11,506	849.3	6,074	3,320	167.1	63,096	32,086	765.6	90,813	46,912	1,782.0
Montana	15,895	13,267	7,835	296.6	6,190	3,760	97.5	17,917	11,056	370.1	37,374	22,651	764.2
Nebraska	19,412	21,454	11,967	750.8	3,776	1,968	134.5	20,708	11,065	653.0	45,938	25,000	1,538.3
Nevada	13,152	2,935	2,508	85.1	1,613	1,366	14.0	3,156	2,605	51.8	7,704	6,479	150.9
New Hampshire	6,354	1,990	994	14.4	897	444	6.1	6,289	3,049	30.3	9,176	4,487	50.8
New Jersey	24,703	6,725	3,362	44.6	1,421	711	10.7	20,830	7,823	21.9	28,976	11,896	77.2
New Mexico	7,379	6,783	4,213	195.0	5,858	3,789	68.3	8,150	5,058	172.9	20,791	13,060	436.2
New York	50,947	56,641	30,412	91.5	50,086	25,040	23.8	198,071	92,905	456.7	304,798	148,357	572.0
North Carolina	24,316	15,003	7,361	281.2	8,390	4,072	85.8	37,960	17,695	507.6	61,353	29,128	874.6
North Dakota	12,522	5,581	2,823	750.0	2,219	1,123	228.3	6,810	3,405	511.6	14,610	7,351	1,489.9
Ohio	36,965	21,524	10,921	62.2	14,953	6,278	23.4	74,901	35,680	195.5	111,378	52,879	281.1
Oklahoma	23,444	11,226	6,204	221.7	9,560	5,004	171.4	19,084	10,100	286.4	39,870	21,308	679.5
Oregon	11,788	2,979	1,804	19.2	4,733	2,900	75.0	13,912	8,500	183.1	21,624	13,204	277.3
Pennsylvania	45,028	8,863	4,432	3.1	30,457	15,011	38.5	90,633	44,115	176.0	129,953	63,558	217.6
Rhode Island	5,277	8,758	4,379	28.8	451	225	1.3	8,007	4,005	37.9	17,216	8,609	68.0
South Carolina	13,448	10,525	5,741	165.7	4,474	2,259	102.1	14,978	7,720	276.3	29,977	15,720	544.1
South Dakota	11,525	10,458	5,979	455.7	1,106	619	107.2	7,408	4,250	341.9	18,972	10,848	904.8
Tennessee	23,376	10,825	5,366	305.7	4,626	2,316	107.0	34,494	15,711	344.3	49,945	23,393	757.0
Texas	57,420	3,617	1,854	101.9	14,006	7,443	286.2	72,525	38,720	1,099.8	90,148	48,017	1,487.9
Utah	8,735	3,760	2,799	54.2	1,570	1,176	51.5	6,485	4,983	70.4	11,815	8,958	176.1
Vermont	4,853	2,962	1,491	35.3	124	62	1.4	7,105	3,539	62.4	10,191	5,092	99.1
Virginia	17,392	14,323	7,220	219.1	6,746	3,415	117.0	22,814	10,448	146.6	43,883	21,083	482.7
Washington	13,508	10,505	5,984	100.7	4,404	2,264	57.7	18,873	9,851	129.4	33,782	18,099	287.8
West Virginia	14,638	9,306	4,698	42.3	2,102	1,074	3.4	15,456	7,723	54.6	26,864	13,495	100.3
Wisconsin	20,443	17,989	9,171	199.5	3,049	1,871	47.8	27,936	13,768	293.1	48,974	24,810	540.4
Wyoming	8,528	2,741	1,816	44.1	1,309	844	21.0	6,414	4,004	136.6	10,464	6,664	201.7
Hawaii	5,293	1,227	614	3.2	2,185	1,073	10.4	7,365	3,921	6.2	10,777	5,608	19.8
District of Columbia	6,083	6,160	3,085	7.9	4,632	1,844	1.1	10,688	5,144	.4	21,480	10,073	9.4
Puerto Rico	10,496	4,930	2,390	32.6	1,605	775	7.1	18,953	8,628	50.1	25,488	11,793	89.8
TOTAL	918,960	620,032	330,732	10,335.8	355,864	183,150	4,237.7	1,533,971	766,559	14,593.4	2,509,867	1,280,441	29,166.9